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Toll Bridges During the Past Decade

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Engineering Aspects of the 1930 Drought

Progress on Mississippi River Flood Control

Construction Data and Prospects

February 5, 1931

ANNUAL REVIEW ISSUE

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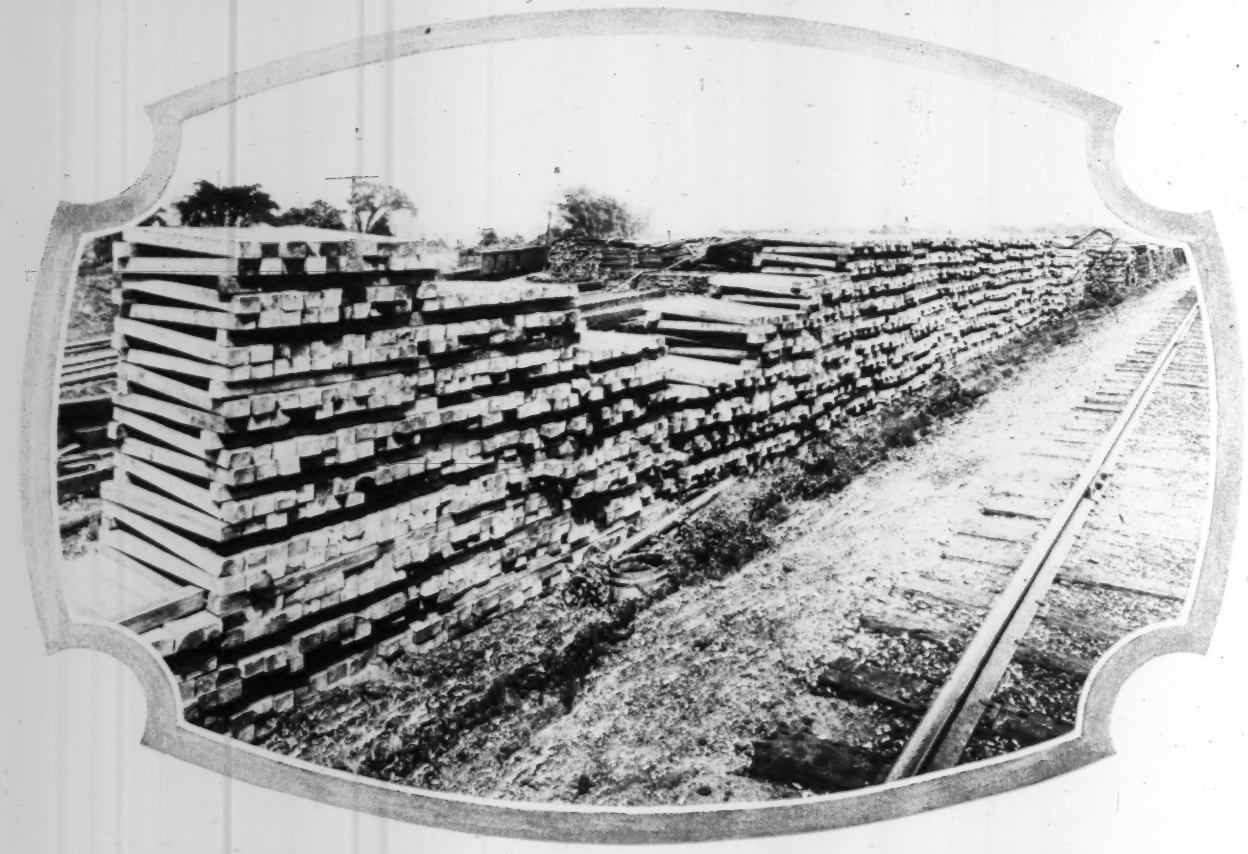

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VOLUME 106, NUMBER 6

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CABLE ADDRESS: "MACHINIST, N. Y."

Published weekly. $5 per year. 25 cents per copy. Entered as second-class matter April 11, 1917, at the Post Office at New York, N. Y., under the Act of March 3, 1879. Printed in U. S. A.

Member A.B.C.
Member A.B.P.

NUMBER OF COPIES PRINTED THIS ISSUE, 31,984

NEW YORK District Office, 285 Madison Avenue
WASHINGTON, National Press Building
CHICAGO, 520 N. Michigan Avenue
PHILADELPHIA, 1600 Arch Street
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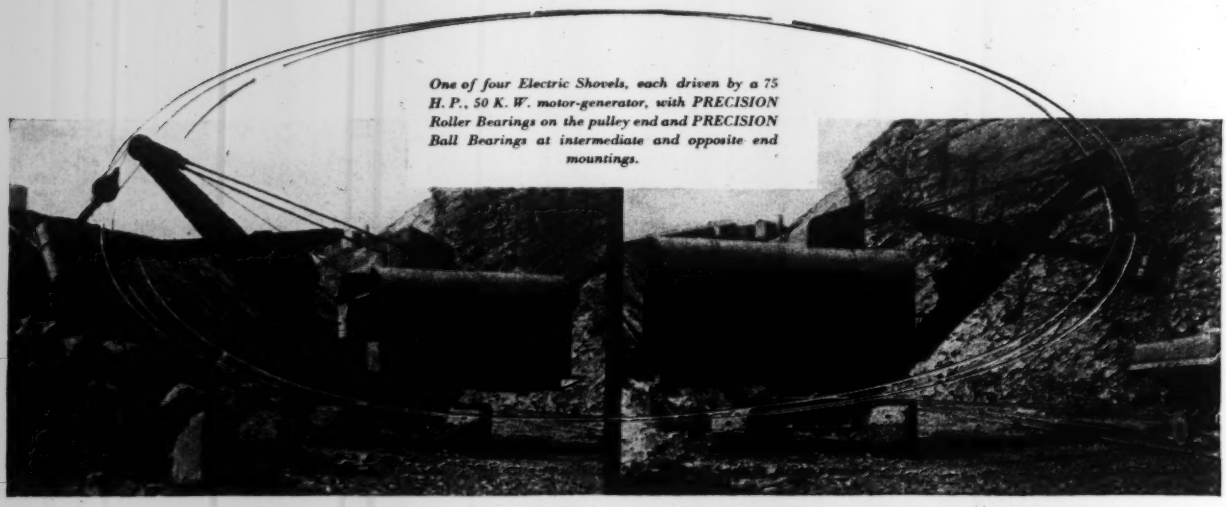

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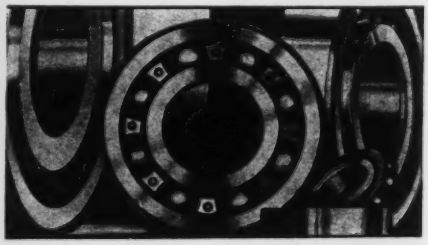

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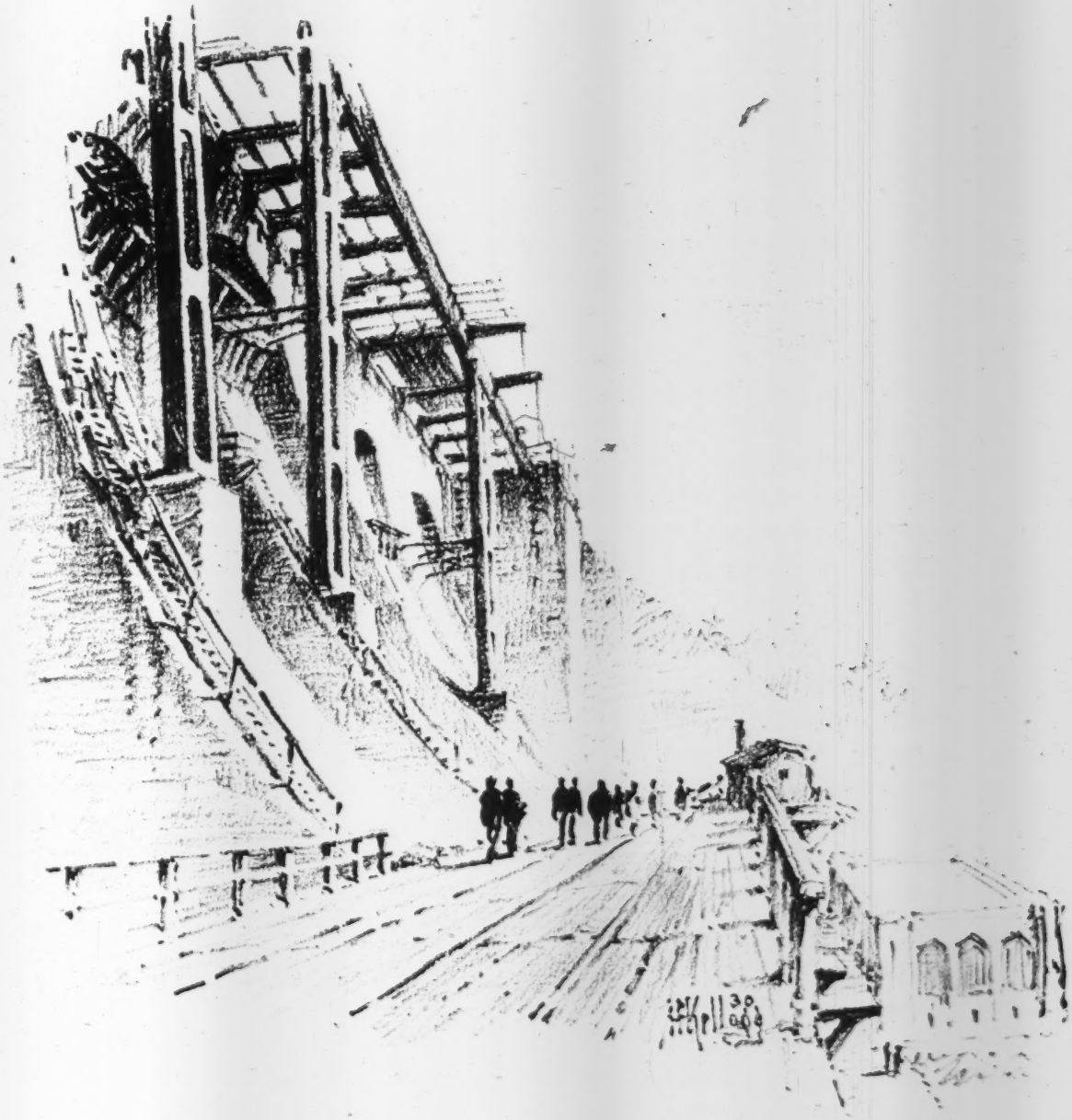


Lower Fifteen Mile Falls Dam
Connecticut River

Engineering News-Record, February 5, 1931

ANNUAL REVIEW ISSUE

ENGINEERING NEWS-RECORD

A McGRAW-HILL PUBLICATION — ESTABLISHED 1874

DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

F. E. SCHMITT, *Editor*

Volume 106 NEW YORK, FEBRUARY 5, 1931 Number 6

Current Engineering Progress 1930-1931

IN THIS annual summary of civil engineering progress *Engineering News-Record* presents four authoritative studies of exceptionally timely subjects that bear on the work of engineers: the new railroad problem of the day, the rise and decline of toll-bridge construction during the decade just completed, last year's disastrous drought, and the phenomenal growth of natural gas supply. The exceptional qualifications of the authors make their statements broad and thoroughly informed analyses.

What the past year has contributed to civil engineering progress is discussed in the editorial review below, with such outline of the coming year's trends as the facts warrant. Farther on in the issue appears a compilation of progress reports on the major engineering projects now under way, and a separate summary of operations on the Mississippi River flood-control project. Finally, construction statistics and price changes are recorded.

Depression and Drought

SEVERE business depression of worldwide extent, aggravated in the United States by a disastrous drought in a broad belt of farm territory, marks the past year and controls 1931 prospects. Engineering construction played a leading part in the year's developments, as it suffered less than did the manufacturing industries and so helped to buoy up lagging activity.

After its beginning in 1929, the depression continued during the first half of 1930; it seemed to be abating by midyear, but a new drop then set in and brought great slackness and unemployment in the last six months. Toward the close of the year the idle numbered from five million upward, by different estimates, and relief work of many kinds was carried on. Most economists consider the depression to be the most severe in generations. Neither economists nor financiers are agreed on causes or cure. There has been much unconvincing talk about overproduction, about too much gold, too little gold, high wages, and the like. One thing is fairly certain: the belief of recent years that a new economic era had been reached, and that the business cycle had disappeared is no longer widely held, and general opinion has returned to the view that booms and depressions will always be with us, though perhaps with less financial looseness and skullduggery.

Some progress in business understanding has been made. Our financial system is now known to be unmodern and not capable of controlling money volume to suit the needs of business. The possibility of using public works as a balance wheel has had much attention. Unemployment insurance has become an active subject. The wisdom of planning business operations for years rather than months ahead has come to notice as a safeguarding policy. These are developments that will lead to some solid gains.

At present it appears that the end of 1930 saw the low point of the depression and that business is pulling out of its dive. A high volume of construction contract awards during the first month of 1931 supports this view.

Construction Fairly Active

ENGINEERING construction did fairly well in 1930, and goes into 1931 with bright prospects, distinctly better than those of general business. Large-sized work —construction for public authorities and for utilities and industries—kept up to a high level, exceeding the 1929 volume and nearly equal to the 1928 peak. House-building dropped to an alarmingly low point, but even including this line of work the country's total construction reached nearly 90 per cent of normal and 80 per cent of peak-year volume. Unemployment in the building trades was severe; figures as high as 40 per cent have been given by union officials. Yet wage rates were well maintained.

Construction budgeted for 1931 is of large volume. A survey by *Engineering News-Record* shows that public works will pass the highest figure ever attained, that of 1928, and will reach $3,800,000,000. Industrial and utility construction is likely to be lower, but when added to public works will reach an aggregrate 5 per cent greater than in any prior year. Private building, the remaining item of construction, is showing signs of resumption, and the total of construction will go to $8,700,000,000, only 3 per cent below 1929.

Costs of construction have gone down sharply, 15 to 20 per cent in little more than a year. This will help to activate construction. It also means that the budget dollars represent a larger actual construction volume.

Public Works for Relief

FOR the first time in our history a consistent attempt was made in 1930 to increase public works as a counterbalance to decreasing private construction, following on President Hoover's suggestions made late in 1929. Road construction by the states was accordingly speeded

up, as noted below, but its total for 1930 was not materially increased. Municipal and other local-authority work, already budgeted, was increased in a few localities, but did not expand on the whole, as citizens became reluctant to authorize expenditures or have taxes raised. The most important action was that in spring Congress increased the federal-aid appropriation from 75 to 125 millions, and announced a similar increase for each of several coming years.

Relief through public-works activities was again discussed actively when, in late summer, the drought was seen to be very serious, crop failures bringing hardship to thousands of farmers. Farmers were to be given work in road construction so that they could earn a living, but nothing resulted. The government then announced its road-money allocations for the 1931-32 fiscal year, hoping that the states would begin at once on the next year's road work and find their own means to finance the government's contribution of next July. This was ineffective, as the states had no way to do this financing. When Congress reassembled in December it promptly appropriated eighty millions as a loan to the states to enable them to meet their share of the coming season's federal-aid work. During much of the year the idea of increasing the amount of public-works construction as a cure for business depression, and the associated idea of advance planning public works to build up a reserve of needed works in good times for immediate prosecution in dull times, were extensively advocated. Nevertheless the fall elections on state and city bond issues for public works showed about the same results as in other years.

Independent of the campaign to utilize public works for relief, all classes of public works reached a high total in 1930, slightly under 1928 and ahead of 1929, as forecast in advance by *Engineering News-Record's* survey (Nov. 28, 1929, p. 836). The year's developments indicate that road building is the chief or only reliance for quick expansion. Energetic efforts are being made to hasten federal building construction, by searching out and eliminating the delays in individual projects, and these efforts have been assisted by legislation authorizing the Treasury to retain private architects and engineers where work can be speeded up thereby. But as all the federal work put together is less than 10 per cent of the country's construction total this speeding up has limited influence; no way has yet been found to bring local public works into the speeding-up reserve plan. Relief by public works has thus made little definite progress; but it has become an important question.

Highway Work and Thought

LARGELY because of the desire to counteract growing unemployment the states constructed some 6,000 miles more road than in 1929. Still further increases will be made during the current year and the following. As matters stand just now, because of the $80,000,000 loan fund the states need provide only $65,000,000 to obtain the use of $235,000,000 federal money, making more than $300,000,000 available for prosecution of the 7 per cent road system. With normal state, county and local expenditures a two-billion dollar highway program is in sight for the year.

Speed of construction is also making progress. This together with forward-looking planning for traffic service and safety and the growth of international road-building activities distinguished the year. All the world is active in road building, even the most remote and un modernized countries, because of the steady spread o highway transportation. Demonstration of this widespread concern in modern roads and the resulting willingness to travel across the world to confer on road-building policies and technique was the most inspiring note of the International Road Congress, held in October at the nation's capital. Delegates from almost seventy countries convened for a week in technical discussion and then traveled thousands of miles over American roads to observe advanced practices and results. This proof of the internationalism of road building was an event of the year. Equally significant was the rise of the conviction that road planning does not stop short at the production of sound structures but reaches widely into the fields of traffic safety and service.

Motor-Vehicle Taxation

CONTRIBUTING close to a billion dollars to highway improvement, motor vehicles showed a small increase in numbers registered (to 26,718,000), and a material increase in tax income. The total tax on motor vehicles approached $1,010,000,000, compared with $930,000,000 in 1929. Not all motor-vehicle tax money is expended for highway improvement, but such a large portion is so used that the figures given dissipate any alarm that the main source of funds for road work is in danger of diminution. However, there is a rapidly growing disposition to divert gas-tax and license-fee moneys to uses unrelated to roads, which will curtail highway system construction. These agencies pressed their demands with increasing force through the year and will find sympathetic listeners among the 44 state legislatures in session this winter, with the danger that motor-vehicle taxes will cease to be service taxes and will degenerate into sales taxes to be distributed wherever depleted tax funds cry for contributions.

Drought and Water Supply

A GREAT drought afflicted the central section of the country during the summer of 1930, with results dealt with in an article on another page. Large areas suffered serious depletion of their water resources. Many individual stations reported the summer as lowest of record in rainfall. The drought still continues, and there are serious winter shortages of water.

Groundwater reserves were depleted early. By the middle of August many streamflow stations were reporting new all-time lows. With groundwater storage still so badly depleted and the rainfall deficiency not yet relieved, prospects are not bright for an early increase in water supplies. Many cities depending on impounded water from small streams have been in a serious condition for months. The dry weather, coupled with unusual summer heat, increased the peak-load deficiency of water systems, and many communities found to their dismay that their impounded supplies were entirely inadequate to withstand such a protracted period of low rainfall. Lexington, Ky., in one of the most severely affected states, built an emergency pipe line more than 10 miles long to bring water from the Kentucky River; Shelbyville for months transported water in tank cars from Louisville, 30 miles away.

Twenty-five years ago an emergency such as this would have been accompanied by many epidemics of water-borne diseases. But public-health engineering is

at such a high level that it was able to cope with the situation; the 1930 drought was free from outbreaks of the kind.

Interstate Stream Questions

INTERSTATE waters continue to be troublesome. The three great disputes remaining after settlement of the Chicago diversion case are now all in court and are nearing final adjudication. The Delaware River litigation of New Jersey, which is seeking to prevent New York from using tributary waters, has been tried; the master's finding favors the diversion. The similar Connecticut River litigation, in which also the lower state, Connecticut, is opposing use of tributaries by the upper state, Massachusetts, was decided squarely against Connecticut by the master, and the Supreme Court is about to pass on this finding. The Colorado River case, attacking the construction of Hoover Dam, has been carried to court by Arizona, and early trial and decision is looked for.

New issues have been raised in the Western states. State authorities are agitating for complete abdication of all federal claims to rights of control over streams, while on the other hand a presidential commission on public land and reclamation policy has been studying the Hoover proposal to build storage or equalizing reservoirs on streams by federal money free of cost to the local beneficiaries, and simultaneously to abandon other land-reclamation work.

River study has progressed during the year, under the 1927 and 1928 laws requiring the army engineers to survey all the navigable rivers of the country and determine the best way of utilizing their waters for navigation, power, flood control and irrigation. The study is about half completed.

Stream utilization is involved in another important question: whether the Federal Power Commission has any control rights over non-navigable reaches or tributaries beyond safeguarding navigation supply. The attorney-general recently held that it has no such rights, but the question is so vital to the strength of the water-power act that it must be regarded unsettled until the supreme court passes on it.

Mississippi and Okeechobee

FLOOD control on the Mississippi, aside from the notable construction program summarized elsewhere in this issue, has been intensively studied, looking toward possible revision of the official plan for the Arkansas and Louisiana floodways, local court action against which caused all construction on the bypass levees to be discontinued in 1929. A review of the adopted plan, particularly in respect to these two floodways, was begun in 1929 and has been actively prosecuted. Additional surveys of physical conditions in the river basin have been made as a basis for a final decision. As General Brown has refused to be stampeded into hasty opinion without full facts, there is prospect of a well-considered discussion of a subject which has too long been the shuttlecock of partly informed debate. Thus the year has brought much nearer a definitive study of flood control of the Mississippi River.

Progress was made in establishing a flood-control program for the Florida Everglades and Lake Okeechobee. Arrangements have been completed for local financing and federal aid; surveys are in progress and construction should begin soon. Following the disastrous floods of 1926 and 1928, the latter causing a loss of life exceeding 2,000, the Okeechobee Flood Control District was created by the Florida legislature. Federal aid was given by the rivers and harbors act of July 3, 1930, approving plans for a navigation and flood-control project to cost $9,027,000, of which local interests are to contribute $2,000,000 and right-of-way. Increased outlet capacity and high protection levees along the lake shore are the chief features of the project.

Boulder Canyon

IN DECEMBER the great dam in Boulder Canyon, recently given the name Hoover Dam, went out for contract, bids to be opened March 4. Construction is certain to begin some time this year. Not only the unprecedented height of 730 ft. but many other engineering and construction features make the project the most remarkable of a generation. The engineers have recognized the necessity of departure from usual practice in building up a single mass of concrete containing 3½ million cubic yards, by adopting columnar construction and an elaborate system of built-in cooling pipes for dissipating the heat of the setting concrete. Bucket depositing is specified, which makes more formidable the problem of placing 106,000 cu.yd. per month. The building of this huge structure in an inaccessible location in the mountainous desert of the Southwest, a territory subject to severe climatic conditions, will call for development of engineering and construction practice to a new high level.

Dams Present Further Problems

NOT only at Hoover Dam but elsewhere, actively increased attention has centered on dam problems. The far west has become steadily more conscious of the questions involved in high dams since the time of the St. Francis disaster. Studies of seepage, uplift, cracking and deterioration were undertaken this years, and California made a careful survey of several hundred dams. Initial stresses and water-load stresses receive more careful investigation. Further studies of the results of tests on models were carried on by the Bureau of Reclamation and the Aluminum Company.

One sensational event of the year was the abandonment of work on the San Gabriel flood-control dam, in Los Angeles County, after several million dollars had been spent on foundation excavation. Badly crushed fault zones revealed in the excavation showed that a safe masonry dam could not be built at the Forks site. This demonstration of the critical importance of foundation conditions had almost as great effect as the St. Francis accident in stimulating attention to the essentials of safe dam construction.

Earth Dams

EARTH dams came into even greater prominence, by virtue of the number of large operations in progress and several serious accidents. The Saluda dam, surpassed in volume by only one other in the world; the dams for the water supply of Fort Worth, Texas; the Alexander dam in the Hawaiian Islands; the Hardy dam in Michigan; the Cobble Mountain, Conklingville and Wyman dams in the east, and the stupendous new

levees along the Mississippi and Arkansas rivers, all under active construction in 1930, make up a group of embankments notable among earthworks. The list of misfortunes is hardly less notable. In February a slide displaced 125,000 cu.yd. of fill at Saluda and one month later the core fill of the Alexander dam sloughed out and virtually destroyed the structure. In November a portion of the Fitler levee, one of the largest of the Mississippi River levees, sank and required costly emergency reconstruction operations. A few weeks later the Corpus Christi dam was breached at one of the abutments of the contained concrete spillway and emptied its reservoir. No lives were lost in any of these accidents except at the Alexander dam, and the property loss was confined to the structures themselves, and so the lessons taught can be accepted with some contentment. They reiterate the facts that the difficulties of managing wet fill, percolation and underflow are such as to rank earth-dam building with the most difficult undertakings of the construction engineer. The year's research work and seepage studies in levee sections and materials recently begun at the flood-control and river-hydraulics laboratory completed this year at Vicksburg give assurance of coming progress, so that despite its discouraging experiences the year has been one of promise.

Waterways

IN THE field of inland waterways two important events are to be noted: completion of the 9-ft. canalization of the Ohio River, and the practical completion of the new Welland ship canal, which opens Lake Ontario to deep-draft vessels navigating in the upper lake. Dredging work now in progress in the Thousand Islands section of the St. Lawrence River will permit such vessels to go down to Ogdensburg, about 100 miles from deep water at Montreal. A further step in waterway development was the federal government's taking over the work of completing the Illinois waterway. Legislation looking toward the taking over of the New York State barge canal by the federal government was passed during the year, but completion of this step must wait the acceptance by New York State of the requirements laid down by Congress.

On the upper Mississippi, work on the existing project for a 6-ft. channel as far as Minneapolis is being carried on in such a way that it can be fitted into the projected channel of 9-ft. depth. Navigable channel work on the Missouri River has been confined chiefly to revetment and dike construction on the existing 6-ft. channel project from the mouth to Sioux City.

The new survey of the Nicaragua canal route, authorized in 1929, is about completed and the board of engineers appointed by Congress to report upon this project and upon additional facilities required at the Panama Canal is now examining the results. At Panama the surveys and preliminary studies for a dam to provide an additional supply of water are well along and it is expected that bids will be called this summer. Traffic through the canal has fallen off somewhat since 1928.

Water-Power Development

THE lessening importance of water power as a factor in meeting the power requirements of the country, a subject of comment in recent years, continues to be evident. Outside of eastern Canada, only a few hydro-electric power plants of any size were built. Steam-generated electric power must continue to supply the bulk of our needs. In water-power development the effect of the 1930 drought also is evident. Despite the new plants in operation actual output of electric power fell off during the year.

On the technical side, water-power development recorded only minor improvements. Hydraulic turbine sizes established a new record in the almost identical runners built for the enlargement of Spier Falls plant in New York State and for the Dnieper River project in Russia, the runners for the latter project, which has higher head, being rated at 85,000 hp. each. Of interest also is the fact that in a number of the large hydro-electric plants now under construction simple draft tubes of the elbow or modified elbow type are being used, whereas a few years ago most plants were equipped with special draft tubes of complicated design; their slight advantage in efficiency is about offset by structural and cost disadvantages.

St. Lawrence Power

INLAND waterway planning and water-power development are closely tied together in the happenings of recent months in respect to the St. Lawrence River. Across the border in Quebec rapid progress is being made on the great Beauharnois power project in the Soulanges section of the river. This project includes the dredging of a ship channel in the intake canal to be available to the Canadian government when it is ready to build locks and approach channel. Farther up the river, in the international section, New York State is considering the construction of a great hydro-electric power project as a joint undertaking with Ontario.

New York's power development planning on the St. Lawrence is a serious undertaking of more than local significance. New York State needs more power, and across the border in Ontario the chief engineer of the Ontario Hydro-Electric Power Commission is urging upon the provincial government the need for planning for more power to be available within four or five years. If, as now appears likely, New York State sets up a state agency similar to the Ontario commission, it is highly probable that the two bodies will join forces in urging the elimination of the difficulties which now stand in the way of development in the international section.

Pipe Lines

PIPE-LINE construction reached a new high during the year as a result of natural gas developments. Gasoline, too, found its way into one or two abandoned oil lines and plans for several new gasoline lines were announced. Oil pipe-line costruction, on the other hand, was at a minimum, and established lines had some difficulty in maintaining the load factors to which they had become accustomed; full storage and slack demand were the principal causes. Natural gas lines were the bellwether, and were extended at a prodigious rate. The "long" 200-mile lines of 1929 were far surpassed. Construction, beginning in the rich Panhandle field of Texas, is being pushed to such remote points as Cheyenne, Minneapolis, St. Louis, Indianapolis and Chicago. The latter line will be more than 1,000 miles in length. In the East, projects have been announced which will bring natural gas as far north as Philadelphia. The discovery of a considerable field in New York may permit piping gas southward to New York City. In the South, Birmingham and Atlanta are being supplied from the Louisiana field. Along the Pacific Coast activity continues in

connecting San Francisco and Los Angeles with the Kettleman Hills and Button Willow fields.

Transportation

CONDITIONS which have forced the railroads of the country into defensive warfare are discussed in detail elsewhere in this issue by Professor Winthrop M. Daniels, of Yale. As he indicates, one significant thing about the railroad situation is that the railroads no longer hold monopoly control of mass transportation on land. Whereas a few years ago it was assumed that motor vehicles might take away a considerable part of the local business of the railroads, it is now becoming more and more evident that not only local but also much long-haul movement of high-grade commodities is going to the highway transport companies. Further, whereas a few years ago the railroads generally held the view that the use of buses and trucks was not for them, now in increasing numbers they are using buses and trucks either to meet the competition of the bus and truck companies or to supplement their own facilities, or even to replace them on branch lines or on heavy-traffic main lines, where the pick-up freight business can be handled by trucks with a gain in efficiency of the main line service through the elimination of the local freight service.

At the same time the congestion of some major highways by trucks has reached the point of interfering with private motor car movement. This is bringing protest from road users, and proposals have been made either to keep trucks off the major highways except at night or to provide separate roads for trucks.

Railroad Consolidation

RAILROAD consolidation came into prominence near the close of the year through the publication of an agreement between the heads of the four major railroad companies of the East upon a plan to consolidate all railroads in Eastern trunk-line territories into four systems. A year previously the Interstate Commerce Commission had announced its plan which distributed the same line among five systems. In this respect the four-system plan runs counter to the commission's plan, and as Professor Daniels points out in his article, in doing so it opens the way for further extended hearings by the commission before anything definite can be done.

Elsewhere in the country there have been but two important changes. Early in the year control of the Missouri Pacific passed to the Van Sweringen interests, thus definitely tying that system to the Nickel Plate-Chesapeake & Ohio system in the East, and in recent months the projected union of the Northern Pacific and Great Northern railroads was definitely abandoned after fruitless attempts to comply with the requirements laid down by the Interstate Commerce Commission.

Railroad Construction and Electrification

NEW construction by the railroads has been confined largely to betterment of existing facilities. Only in the southwest has there been any considerable amount of new line construction. In the modernization work large sums are going into the construction of city passenger stations and extensive freight terminal facilities and into the electrification of terminal and suburban lines. Expenditures for grade-crossing elimination continue to be one of the largest items the railroad companies have to meet. The largest single item of this kind is the West Side improvement work of the New York Central at New York, an operation which is expected to cost close to $200,000,000.

Considerably more than 100 miles of electrified railway lines was put into service during the year, and more mileage will be put into service in 1931. The most extensive mileage put into operation was on the Lackawanna R.R., where a program of electrifying the suburban lines is about completed. The Pennsylvania is continuing work on its program for electrifying its lines between Washington and New York and as far west as Columbia, Pa. Much of this work is in the Philadelphia zone. At Philadelphia the Reading Railroad also has a considerable amount of electrification work in hand. In New York the New York Central is changing over the operation of its West Side line from steam to electric, using oil-electric locomotives during the reconstruction period. At Cleveland an electrified zone through the new union station is now in operation, and at Chicago further electrification of suburban lines is under consideration.

Air Transport

AVIATION has been trying to get over the headache contracted during the boom of 1929. Deflation continued in the manufacture of planes and parts; yet the total approximated the figures for 1928, considered a prosperous year. Operation of air lines scored some advances, airport activity was below 1929, and important developments were noted in the rigid airship field. Passage of the Watres bill in April, giving air mail contracts to operators, improved operating prospects.

Great strides were made during the year toward stability of the industry. There are still many more manufacturing units than are economically justified, but on the other hand 90 per cent of air transport operations are in the hands of four groups. Three coast-to-coast air lines and four north and south intersecting lines are now operating. During the year the coast-to-coast service was reduced from 48 to 36 hours. The total mileage of established airways increased from 36,330 in 1929 to 47,184 in 1930. The total miles flown increased to 43,000,000, compared with 25,000,000 in 1929. An estimate of the total number of passengers carried during 1930 is 400,000, compared with 150,000 in 1929. Air transportation was safer in 1930.

Airport construction during the year totaled about $35,000,000, compared with nearly $50,000,000 in 1929, but most of the activity was improvement and extension. New projects were largely municipal, private promoters being discouraged by general conditions.

In the field of rigid airships, the most notable development in the United States was the completion of the framework of the "ZRS-4," being built for the navy at Akron. During the year a mobile stub mast for handling airships was successfully developed, and with its use the number of men necessary to dock the "Los Angeles" was reduced to 50. The unexplained disaster to the British airship "R-101," which crashed in France, was a severe blow to rigid airship development.

City Transit

OUTSIDE of the construction of additions to the rapid-transit systems of a few large cities, there have been no important changes in city transit facilities.

New York City expects to begin to benefit by its new Eighth Ave. subway system before the end of the year, but it still must spend millions upon feeder lines before that system is completed; and in the meantime it is pushing forward the plan for an additional system with its trunk line on the east side of Manhattan Island. Chicago's long-talked-of subway is beginning to take form in definite plans submitted to the city for action, but new legal difficulties threaten long delay before construction will begin. In Philadelphia extensions of the subway system put into operation about a year ago are under construction.

The most recent and in some respects the most unique rapid-transit system of the country is one put into operation at Milwaukee this year. It is a 10-mile line built partly elevated and partly depressed on a private right-of-way and extending from the center of the city out through the suburban section as a supplement to the existing street railway system.

Census Information

RESULTS of the fifteenth census of the United States, now being tabulated and already available in part, will give the engineer much-needed data. The old subjects included in the current census are population, agriculture, irrigation, drainage, mining and manufacturing. New features are unemployment and distribution of goods, both expected to throw light on the cause and prevention of industrial depressions. Results already at hand emphasize anew the inadequacy of a decennial census. This has been recognized as regards manufacturing and agriculture, the first of which is to be covered every two years and the second again in 1935, but the basic figures, on population, are still gathered only once in ten years. A more frequent count of heads, with a limited amount of data on distribution of population, is needed for use in many important studies—engineering, industrial social, economic. New emphasis is given this need by the widely erratic fluctuations in population recorded by the fifteenth census.

Significant City Growth

CITIES continue to grow at a rapid rate, the new census has revealed. Urban population is now 56 percent of the total, nearly 100 cities have passed the 100,000 mark, and 400 the 25,000 mark. Central and satellite cities are coalescing to form metropolitan districts, the greatest of which embraces eleven million people. The engineer is heavily involved in these changes; old needs are growing and new ones rise up. Few cities, even, have yet provided all their people with adequate water, though of all municipal services water service is nearest perfection. Less complete are paving, sewerage, refuse disposal, fire protection and transportation. Imperfect municipal administration and finance remain heavy handicaps to progress. The tax burden on the citizen is heavy, and 1930 heard more protests against it than prior years. But long-time advance planning of works is as much needed as more ample funds.

Since municipal engineering is helped by stabilization of land use, it is useful to note that three-fifths of the urban population now lives under zoning restrictions. This makes it increasingly possible to layout and build public services to fit the logical growth of the future. Detail knowledge of zoning is improving.

In the matter of the problems of metropolitan region 1930 saw little progress. New York's highly elaborat plan—unofficial—is completed and now waits to fin practical application; an interesting fact is that the ci has just organized a planning bureau, its first attempt whose efficacy remains to be demonstrated. Philadelphia, whose master plan approaches completion, ha begun cooperative efforts toward applying it, particularly in building bypass highways around the antiqu maze of the core area. San Francisco still largely lack organized metropolitan thinking. Chicago's work i beginning to have effect, and large savings to futur generations are in sight, as the skeleton of the traffic artery system is being provided. Official planning i accomplishing useful results in such regions as West chester, Cleveland, St. Louis, Milwaukee and Los Angeles.

Changes in Sanitary Service

AMONG the developments in water purification may be noted the drive to eliminate tastes and odors and the evident success attained by preammoniation, particularly in cutting phenol tastes and odors to a minimum. Removal of disagreeable tastes and odors due to algae has not improved. Activated carbon is receiving more study. More careful chemical mixing and better selection and washing of filter sand are active matters, the latter especially because the St. Louis filter underdrains failed to hold up the very uniform sand supplied.

An outstanding event was the overwhelming vote of the people of Chicago in favor of filtering the supply from Lake Michigan, which demonstrated the emphatic public demand for high quality of water even when politicians and newspapers are neutral. But water softening still obtains less than its due attention.

Treatment of sewage remains a vexing problem. Sludge digestion is in the foreground; two-stage digestion with heat and with storage is gaining.

Motor Car and Traffic Relief

MORE elaborate boulevard facilities are required every year to handle the motor car, truck and bus traffic. Last year contributed several noteworthy projects. In Pittsburgh extensive boulevards have been built along each side of the Ohio River, replacing the winding routes through the adjacent hills. At the end of the year about 40 per cent of the $60,000,000 highway and boulevard development of Cuyahoga County (Cleveland, Ohio) had been completed, including numerous bridges. Los Angeles built the complicated Hyperion-Glendale viaduct to give uninterrupted flow of traffic at a three-way crossing. A section of elevated highway was built in New York. Meantime congestion is not decreasing. The excessive use of stop-and-go signals is being fought, fortunately; Pennsylvania abolished many nuisance installations of such signals. The accident rate seems to be decreasing, but very slowly. Driver-license states show up best, a powerful argument for extension of licensing.

Buildings

DESPITE decreased activity in the building field, several developments stand out. Measured by almost any standard the Empire State Building in New York, 1,250 ft. high and 36,000,000 cu.ft. in bulk, sets a sensa-

tional new record. It is featured by column loads of unprecedented magnitude, a well-arranged windbracing system, and success in carrying out an exacting completion schedule. Its unique wall construction, combining aluminum, chrome-nickel steel, glass and stone, is one of the first evidences of a rationalization of skeleton-frame inclosure practice. Other developments in wall design were recorded by an apartment house in Chicago which uses a combination of chrome-nickel steel and glass, and by a research building at the A. O. Smith plant in Milwaukee in which permanently closed bay windows fill each panel.

The latter building also introduced built-up hollow columns and beams in which are housed all conduit, piping and a mechanical ventilation system. A welded steel-plate floor in this research building, and steel channel floor strips in a pier shed of the Erie R.R. at Weehawken, point toward changes in floor practice.

Tall buildings continue to multiply. In Cincinnati the Carew Tower, covering a whole block, houses a 48-story office building, a 30-story hotel and a 29-story garage. In Pittsburgh the 40-story Cathedral of Learning and the 37-story Gulf Refining Building were added to the skyline. The Sun Life Insurance Co. erected a monumental building in Montreal, while the New Canadian Bank of Commerce Building in Toronto, rising 465 ft., takes rank as the tallest structure in Canada. The greatest activity in the tall building field was seen in New York City. Among the structures completed or nearly completed during the year were the 741-ft. City Bank-Farmers Trust Building, the 699-ft. 500 Fifth Ave. Building, the 638-ft. Irving Trust Building, the 616-ft. R.C.A.-Victor Building, the 616-ft. twin-tower Waldorf-Astoria Hotel, the 560-ft. Nelson Tower, the 511-ft. Continental Building and the 503-ft. Hotel Pierre. Work was also well started on the 840-ft. 66-story Cities Service Building, which will house the first installation of double-deck elevators. Boston, which up to 1929 had a height limit on its buildings, has seen the beginning of construction on the 40-story Professional Building, to cost $30,000,000. A new height record was set in Kansas City by the new power and light company building, which is also notable because the inclusion of a large auditorium made it necessary to use deep trusses as spandrel beams and to throw all of the wind load into these wall bents.

New Bridges

BRIDGE activity lagged somewhat in 1930 in comparison with the immediately preceding years. New undertakings of note are three Allegheny County structures at Pittsburgh—the McKees Rocks and West End steel arches and the George Westinghouse concrete arch, whose span of 420 ft. is the longest yet attempted in this country. A new suspension bridge at Tenth St., Pittsburgh, is practically ready for bids. In New York City, foundation work on the new Triborough bridge over Hell Gate began. A 700-ft. suspension bridge at Bucksport, Maine, also rates among the large new projects of the past year.

Construction is to be started in spring on the 4,200-ft. suspension bridge over Golden Gate, a benefit-district toll bridge. A commission of state and federal authorities agreed upon the location of the $12,000,000 San Francisco Bay bridge to Oakland. War department permission was granted for the Belt Railway bridge, and for the Hero-Hackett bridge in New Orleans. Plans have been completed for two concrete arch bridges over the Niagara River near Tonawanda, N. Y., and for a cantilever crossing of the Hudson River at Catskill.

In the toll bridge field the most important development of the year was the decision of several states, notably California and Kentucky, to enter on a program of publicly owned toll bridge construction and purchase. Coincident with this was the decline of private toll bridge promotion to absolute zero.

Progress of Current Bridging

BRIDGE work begun before 1930 went ahead. The 1,652-ft. steel arch over the Kill van Kull was brought to a stage where roadway concreting can be commenced in the spring. The same is true for the 3,500-ft. Fort Lee-Hudson River suspension bridge. The South Shore bridge at Montreal, which includes a 1,097-ft. cantilever in its 2 miles of bridge structure, was opened May 24; the 1,495-ft. Mid-Hudson suspension bridge on Aug. 25. The Columbia-Wrightsville bridge over the Susquehanna, 28 arches, longest of its type, was also opened to traffic. Tower erection was completed on the 750-ft. suspension bridge at Toledo, Ohio. A continuous-truss bridge of two 628-ft. spans over the Mississippi River was opened at Quincy, Ill. At Vicksburg a combined railway and highway bridge with a cantilever span of 825 ft. was completed. The Southern Pacific Railroad's Suisun Bay crossing, one of the heaviest bridges in existence and designed, like the near-by Carquinez Straits cantilever, to resist earthquake action, was completed. The Oregon highway department has under way a series of 230-ft. concrete arches over the Rogue River, utilizing the Freyssinet method of construction by jacking at the crown to lift the arch rib off their centers and fix the dead load stress condition.

Structural Advance

NEW structural knowledge, verification of existing data and new developments in materials and methods played their full part in 1930 history. A new cement specification was adopted, raising tensile strength requirements about 20 per cent at seven days and 8 per cent at 28 days. Indicative of the trend toward higher unit stresses in concrete, it is notable that a 1:2:3 concrete used in a viaduct in Washington State was designed for 1,200 lb. per sq.in. in bending and 360 lb. per sq.in. in shear. Definite progress was made during the year in the study of wind design of buildings, a wider realization of the importance of designing for comfort of occupants being discernible.

In the field of suspension bridges, definite advance was recorded by the development of a high-modulus rope strand suitable for main cable service. First used in the foot bridges of the Fort Lee bridge, the strands have been adapted to use on a 950-ft. suspension bridge in Quebec and on the 1,200-ft. St. Johns span at Portland, Ore.

Building codes furnished another active subject for discussion during the year, and some definite advances were recorded. In New York City comprehensive revision of the code, last revised in 1915, is under way, and one section, that encompassing an 18,000-lb. unit steel stress, has been adopted. Much of the building code revision throughout the country has resulted from requests for approval of structural welding. Welding registered notable advances during 1930. The largest all-welded

structure was completed in Pittsburgh—eleven stories tall and involving 2,000 tons of steel. The tallest all-welded building was built in Dallas, rising to nineteen stories, while another Dallas welded building was designed for 22 stories, though built for the present only to fourteen stories. Welded buildings of twelve to fourteen stories were completed in Los Angeles, Boston and Wilmington, Del.

One of the most important structural developments of the year was the entrance of aluminum alloy shapes and the publication of test results which showed that aluminum beams compare very favorably in strength with steel beams, averaging only about half the weight and carrying on the average 13 per cent more load.

Research

INDUSTRIAL research gained vigor during the year, perhaps under the spur of depression. Indeed faith in research is a continuing characteristic of the times, as visibly evidenced by several elaborate new research buildings of industrial works.

An extensive series of reinforced-concrete column tests sponsored by the American Concrete Institute was begun at Lehigh University and the University of Illinois. The 1,600 welded specimens in the program of the American Bureau of Welding have been nearly 90 per cent fabricated and tested. Recording instruments are being installed in the Empire State Building to collect wind-pressure data. Work at the Portland Cement Association's laboratories, the Bureau of Standards and other laboratories continues. At Illinois model studies on reinforced-concrete arches demonstrated conclusively the important effect of the deck action on the rib stresses, particularly where the deck is integral with the rib at the crown. Rail studies in the same laboratory point toward fatigue action as responsible for failures, through excessive shear. Flame-cutting of I-beams for use as wind brackets in tall buildings was again the subject of discussion, as a result of tests at Columbia University purporting to show that flame cutting after punching causes brittleness. Subsequent tests in Detroit and at the Bureau of Standards failed to substantiate the Columbia conclusions, and indicated as a whole that flame-cut details are of satisfactory quality. Similar deductions are suggested by Lehigh tests.

Construction and Contracting

FEW changes or developments were made in construction practice, but distinct advances were noticed in improving conditions and establishing better relations within the contracting industry. Speed in tall building construction maintained its previous pace with the development of new methods of handling materials in the rapid erection of the Empire State Building in New York. In the highway field premixing and mechanical mixing in place were offered as alternates to blade mixing. An innovation in concrete highway construction was the use of two mixers in tandem, first appearing on an Illinois road job. A new method of sinking cylindrical caissons by boring a hole with a combination auger and water jet and placing a casing before the hole was pumped out proved to be successful on a railroad bridge pier project in New Jersey. These are but a few isolated examples of improvements in construction technique.

The construction safety movement showed progress in 1930. Remarkable safety records were made on several tall buildings. But that much remains to be done in safety work is evident from the heavy casualties in tunnel and scaffold accidents.

Except for the drop in volume of business, conditions within the contracting industry showed improvement and much was done to promote sound practice. Prequalification met with increasing favor, especially in highway work. Philadelphia's prequalification ordinance was revised to meet legal requirements and now seems to be satisfactory. Activities of the Associated General Contractors of America last year will result in better relations and improvements in contracting. This organization took steps toward cooperating with subcontractors, establishing a home-builders' affiliation and abolishing discriminatory material prices. The remarkable success of the Bureau of Contract Information, hardly more than a year old, indicates that progress is being made in establishing contracting on a sound business basis. Credit reform received much attention during the past year.

Better Equipment

FEW major developments occurred in the equipment field, but much improvement was achieved. Further increase of alloy steels, frictionless bearings and welded frames claims attention. Unit-assembly parts are appearing on construction equipment in increasing numbers. Highway-grading machinery is being motorized and also built for attachment to trucks. Heavier grading equipment for tractor use was brought out. Rubber crawler treads for tractors and power graders gained a foothold. Highly developed central concrete plants, conveyors and pumps for handling bulk cement, heavier road forms capable of carrying subgrading and concrete-finishing machinery, figure in the year's contributions. Machines for field mixing of bituminous surfacing are being tried. No radically new equipment appeared on the Mississippi levee work, but tractors, elevating graders, dump wagons and other machinery were made stronger and heavier. A general return of the elevating grader is indicated, due to the power take-off or separate-powered operation of the grader and the development of the tractor-hauled crawler dump wagons. Adoption of diesel power or electric power supplied from portable diesel units goes forward. Longer booms for draglines are appearing on levee work, 175-ft. booms being common.

Professional Relations

CHIEFLY notable among professional matters during the year just past is the progress being made toward a solution of the difficulties which have disturbed relations between the architectural and engineering professions for some time past. Since the opening of the new year the committee set up to study the subject has made its report to the several engineering and architectural societies concerned but final action has not been taken.

No important changes occurred in registration laws. Up to the present time 27 states, the District of Columbia and the territories of Hawaii, Porto Rico and the Philippines have laws governing the practice of engineering, architecture or surveying. The model uniform registration law received the indorsement of the American Society of Civil Engineers and the American Association of Engineers in April, 1930, and since that time has received the indorsement of eleven other organizations.

LOWER MANHATTAN'S NEWEST TOWER, THE 741-FT. CITY BANK-FARMERS TRUST BUILDING

Engineering News-Record, February 5, 1931

The Railroads: Their Backs to the Wall

A discussion of the factors within and without their control which have forced them into a fight for their existence

By WINTHROP M. DANIELS
Professor of Transportation, Yale University
New Haven, Conn.

FEW MEN have had as full an opportunity to study and appreciate the problems as well as the shortcomings of the railroads of this country as has Winthrop M. Daniels. As a member of the Interstate Commerce Commission from 1914 to 1923, he was in intimate contact with their operations through the period leading up to the time when the government took them over, through the period of government operation, and finally through the years of rehabilitation after the railroads were turned back to their owners. Since 1923 he has been professor of transportation at Yale, a vantage point from which he has been able to view recent development without the distractions incident to the strenuous task of an interstate commerce commissioner. —EDITOR.

OLD DAME MISFORTUNE, who has long dogged the railroads, served them another scurvy trick in disguise during the closing days of the year just past. The railway executives had promulgated, late in November, their sober and thought-provoking declaration of policy. Before it had a chance to sink into public apprehension, there came the sudden announcement of an agreement between the four Eastern trunk line presidents as to the eventual consolidation program in their territory. It appears that they had been stirred by President Hoover to come to a common understanding; the White House publicly expressed its gratification; railroad stocks on the exchanges awoke from their lethal depression, and the New Year opened with the optimistic idea that recovery in the railroad transportation field is imminent. The head of an important railroad security owners' association proclaims: "The dark cloud which has hung over railroad owners and executives for the last few years is lifting, and the future for them once more looks bright."

New Factors in Transportation

Without in any wise disparaging the railroad executives' "Treaty of Versailles," it will be well to get back to the trenches and to observe closely the situation there disclosed in the declaration of policy of the railway executives. In this declaration for almost the first time the responsible railroad managements take the public into their confidence as to the inroads, not to say the ravages, which motor transport has made upon the domain of rail transportation. Ten years ago, and even more markedly twenty years ago, rail transport was the indispensable means of covering land distance for man or goods. During the two decades just past an industrial Bolivar named Ford has liberated both persons and property in great measure from the iron rule of the Iron Horse. It is too soon, of course, for the modern Gibbon to write the Rise and Fall of the Railroad Empire. We are often reminded that it must remain the backbone of our transportation system. Nevertheless, the backbone has been severely jarred and some of the most promising members have been completely severed.

First among the causes leading to the extreme decline in railway traffic in the last decade the railway executives point to "motor vehicles, coupled with improved highways." The total number of motor vehicles registered rose from 9,231,941 in 1920 to 26,501,443 in 1929; and motor trucks increased from just over a million to 3,379,854. The decrease in passenger mileage in the same ten years has been 34.2 per cent, and in annual passenger revenue, over 400 million dollars. While the motor bus is the most conspicuous competitor for railroad passengers, it is the private car which has captured the bulk of the traffic, even motor coach lines having lost heavily in many instances to the private automobile.

The motor truck repeats the tale of the motor car, but, fortunately for the railroads, on a much smaller scale. It has depleted less-than-carload traffic by about 32 per cent since 1920, and within a radius of a 50-mile haul is said to have taken 90 per cent of this merchandise traffic. The total less-than-carload tonnage is on the average perhaps less than 3 per cent of the total rail tonnage. But it is high-rated tonnage, yielding revenue in excess of its proportion of the total volume. It is this traffic which the trucks have sought, and, to a large degree, captured.

Trucks Profitable in a Widening Field

More disquieting still is the increasing radius of truck operation. Whereas five years ago it was supposed that 30 or 40 miles represented the limits of the profitable trucking haul, this has been extended in some cases to 250 miles. The trucks' inappeasable appetite for traffic has not confined itself to that moving in less-than-carload lots. Livestock and gasoline are moving heavily by truck, as well as other forms of carload traffic. The supposed instability of the fly-by-night trucking concern has been succeeded by the appearance of certain trucking corporations which know their costs, are stabilized financially and are rendering regular and dependable service

Formidable as the motor vehicle is in respect of its competitive qualities, it has the cards stacked, as it were, against its rail rival. It is largely free from cramping regulation. Its operatives are unorganized; are content to work long hours and at lower rates of pay than prevail among rail employees. Its taxes are no more burdensome than the railroad's. It has no maintenance of roadway expense to absorb out of gross revenue, although this item is not far from 18 per cent of the railway's operating costs. It is the beneficiary of state and federal expenditure on highways; and, most important of all, it is linked in community of interest to the great majority of the population, which is acutely interested in the maintenance and expansion of the hard-surfaced highway system. It is small wonder that Sir Arthur Stanley,

president of the London Institute of Transport, recently remarked of the analogous situation in England: "As a consequence of improvements in highways and air transport, railroads have lost the virtual monopoly they once enjoyed."

The railroads' reaction to the motor menace had various aspects. Originally they tried to ignore it. Seven or eight years ago, in a public transportation conference in Boston, the general manager of one of the largest New England rail systems declared that his company had been chartered to operate on rails and had no intention of operating elsewhere. The same system today operates 249 motor coaches on 61 routes, 26 of which are substitutes for rail service, besides operating a large fleet of motor trucks.

The truck is now widely employed as an economizing device that allows the curtailment of way freights. It is used in the transfer of freight between connecting rail carriers. It is apparently destined to afford pick-up and delivery service on a wide scale in urban areas. The employment of the Railway Express Agency for this purpose in New York City is said to be under advisement. Incidentally, the R.E.A. owns 9,759 trucks, and railroads themselves were using nearly 6,000 trucks at the close of the year 1930. In other words, the railroad policy has wisely changed to one of employing the motor vehicle in conjunction with rail transportation, where it can promote economy or strengthen the competitive quest for traffic.

Rate Experimentation

In two other respects the motor menace has effected important changes in the railroad situation. It has compelled much rate experimentation and it is making a new realignment of interest as between the companies and their employees.

In the attempt to recapture passenger traffic, certain rail carriers, particularly in the Southwest, as illustrated by the Frisco, have dropped their passenger basis from 3.6c. to 2c. per mile. For longer hauls some of them —for instance, the Santa Fe—have begun experimenting with a three class fare system. Between Chicago and California, the Class I fare, permitting the ticket holder to use standard Pullman service, is reported to be $103; the Class II fare, allowing only the use of tourists sleepers, $77; and the Class III fare, honored only on coaches and chair cars, $50. In the freight schedules similar cuts have been made to neutralize truck competition. For example, alarm over the carriage of cotton by trucks led to a 50 per cent reduction in the rail rate in some portions of the South.

Concurrently with the rate changes induced by motor competition there are signs that the railroad employees are fast moving in the direction of making joint cause with the railway managements against the undue prejudice jointly suffered from the unregulated competition of rivals, including both motor bus and truck, as well as the subsidized competition of inland waterways. The four brotherhoods and the switchmen's union in November last decried the unfairness of the present competition.

Just the month previous the Brotherhood of Railway and Steamship Clerks declared for standardizing the rates and service of the motor trucks and the hours of labor of trucking employees. While the simultaneous movement for the six-hour day and the five-day week in railroad employ may indicate that belief is not yet wholly dead in the magic fund doctrine of wages, still the official denunciation by the railroad employees of the unfa[ir] competition which the railroads now face would see[m] to indicate that they realize that railway gross reven[ue] is not a Fortunatus' purse with an infinite bottom.

Just how far the throwing of the regulatory net ov[er] the motor coach and motor truck will suffice to aba[te] the difficulty is hard to predict. Whether private an[d] contract trucks can be duly handicapped by taxation [or] otherwise so as materially to lessen the inroads whi[ch] they threaten to rail revenue is extremely doubtful. Som[e] experienced railroad men, such as Mr. Neff, of the Mi[s]souri Pacific, declare that regulation confined to commo[n] carrier truck lines will not suffice to put truck and rai[l] competition on a fair basis. Mr. Powell, of the Sea[-]board, says that only taxation and regulation of the mo[-]tor vehicle will restore fair competitive conditions fo[r] the railroads. The truck rates are said to be a little higher than rail rates, and the competitive problem here, unlike that in passenger service, appears to be one of service more than one of rates. The difficulty is likely to be political. Even with the weight of the railway employees thrown into the railroad scale, there is the equally large popular interest of the truck operators, private as well as public, to be encountered in opposition.

From whatever standpoint viewed, the railroad case is a hard one. The pipe lines, with 85,796 miles of lines, are taking over, at rates from one-half to one-quarter of rail charges, an increasing amount of the crude oil traffic. The power companies, by long distance transmission of power, are distantly threatening to check the growth of the coal traffic, which alone constitutes over a third of the tonnage and a fifth of the rail carriers' freight revenue. The port-to-port rates, subject to no regulation and as variable as the winds, restrict the coastwise carriage of the railroads. The prospective expenditure of 300 millions this year on highways, to say nothing of the prodigal expense contemplated on waterway projects in the Mississippi and St. Lawrence, are enough to stagger the imagination. And on top of prodigious economies accomplished in the last decade by improved methods of operation, by a capital outlay of nearly eight billions, and by the enhanced morale and efficiency of their employees, the railroads find themselves confronted by an impasse which they are desperately trying to break through. It is small wonder that Mr. Lee, vice-president of the Pennsylvania, doggedly declares: "The railroads, their stockholders, their employees and their managements have rights, and we are going to fight for them with the best that is in us."

Where Does the Trouble Lie?

Questions which naturally arise in connection with the railroads' confessed predicament are: to what extent is it due to regulation; to what extent is it remediable by extending regulation to competing transportation agencies; to what extent is it attributable to railroad policy in the past; and to what extent is it due to technological changes in transportation.

It is not possible in a sentence to characterize the general results of the federal regulation of carriers. It has to its credit the essential abatement, almost the complete elimination, of unduly prejudical rail rates. This is an outstanding and significant achievement. It has grappled with the rationalizing of rate structures, particularly those connected with the long and short haul, although the more recent rate revisions have verged on a mechanical idealization of distance to the partial exclusion of other valid considerations. Its handling of security issues,

leases, acquisition of stock control and the like has been on the whole sagacious and successful. Its tedious struggle with valuation has been expensive and vexatious; and the chief gain therefrom has been a more definite knowledge of the extent to which rail property corresponds with rail capitalization. Its experiment with recapture of excess earnings has, to date, been a confessed fizzle.

The Interstate Commerce Commission's accomplishment, however, must be appraised in the light of the burdens which Congress has from time to time imposed. The blight of the Hoch-Smith resolution and the lamentable refusal of the Senate to confirm Commissioner Esch have been damaging beyond measure. The most persistent limitations of the commission have been its inability to envisage changing economic trends and a hesitant timidity to adjust its measures thereto. The bulging prices of 1914, with the higher levels of labor and material costs, fairly cried out for an increase in the general rate level. But the opportunity was lost then, and repeatedly thereafter. Only during the fools' paradise of 1920, when even the shippers thought all prices were necessarily like the "sparks that fly upward," was the pressure of prudential inertia sufficiently released to concede an effective advance in railroad revenues. The federal body finds it difficult to shake off its earlier rôle of the shippers' champion. With the legislative power to initiate rates, it passes the buck to the carriers, preferring to apply its critical microscope and scalpel to plans submitted by others, rather than to blaze a path itself.

The financial results of rail transportation during 1930 were in great part the inevitable results of regulatory inertia. With a long-continued annual rate of return upon carrier property admittedly below what the commission has consistently held was only reasonable, the cyclical revenue trough, due to technological changes in transport, and the annual revenue trough, due to industrial depression, have coincided. Some of the results, actual or imminent, are: the necessary curtailment or omission of many dividends; apprehension that bonds even of strong roads may be disqualified for savings bank and trustee investments through failure to earn the prescribed legal margin over bond interest; impairment of railroad credit with the likelihood of worsening the stock-bond relation in capital structures; and threatening legislative hostility to any further economies that may involve displacement of employees.

It must be presumed that if the common carriers by bus or truck, the coastwise shipping lines, the inland water carriers or even the proprietary pipe lines were made subject to regulation, the character of the regulation would be much the same. While this would lessen some of the wholly unfair disparity of which the railroads justly complain, it would only partly restore parity. Should it be coupled with Senator Couzens' proposal to keep the rail carriers wholly divorced from owning and operating motor trucks and buses, it would damage them far more than it would aid.

Railroads Not Free From Blame

No small part of the railroads' plight is due to their own invertebrate policy. They complain of the commission's nibbling away at their rates, and their complaint may often be justified. But that is what they persistently do themselves. They cringe at the big stick of the big shippers, some of whom pointedly tell them of whom to buy their railroad supplies. Mr. Lee, of the Pennsylvania, cautiously concedes that "the railroads are not entireless blameless. . . . There have been instances where some individual railroad attempted to gain temporary advantage by a lowering of a specific rate and then found that all it had accomplished was a reduction in net all around." To my knowledge there has never been compiled in tabular form a comparison of revenue losses due to commission orders with revenue losses due to the futile rate cutting which Mr. Lee so properly condemns. If the greater part of the loss is due to commission orders, why do the carriers not set forth the facts in quantitative form?

Slow to Act on Rates

Another fault lies at the carriers' doors. When they know a rate is unjustifiably low, they do not promptly file a schedule to raise it. From what I understand, I gather that the New York Central commutation rates to and from New York City have for years been on an unreasonably low level. Having long deferred advancing the charges, they now invite redoubled animosity by publishing an increase just at the moment when hard times make their patrons more than normally sensitive. Where rate increases require the cooperation of more than one company, the process is infinitely harder. In old Poland one negative vote in the Senate constitutionally sufficed to defeat a proposed law. It is so in large measure as between carriers. But there is a power to set minimum rates in the commission. Why should not a recalcitrant carrier be smoked out by carrier complaint asking the fixation by order of a minimum rate? It is not a far guess to opine that it would be hard to find a carrier which would not have to lower the shutters if their neighbors' glass houses were bombarded with stones. It is easier to cry out for an Albert Fink or a railroad czar, such as the Mussolini of the Movies, than to undertake the homely task of cleaning house.

Railroad policy seems to me to be lacking in another respect. The carriers in important instances have preferred to complain over commission action than to match and, if possible, to overthrow in the forum of public opinion the reasons upon which regulatory denial has been based. Rail rates to Pacific terminals afford a good illustration, particularly as they are given prominence in the railroad executives' recent declaration. The transcontinental carriers complain over the alleged refusal of the commission to recognize the force of water competition via the Panama Canal.

In *Transcontinental Rates*, 1922 (74 I.C.C. 48) the eastbound applications, asking to establish lower rates from California terminals to New York than from intermediate interior points in New York, were granted. The principle of recognizing water competition was clearly conceded. The eastbound applications were approved on the express ground that "the prejudice found . . . to exist by reason of the wide blanketing of rates under the general westbound application is not here present." The fact is that their westbound proposal was motivated by the hope of dislocating industries or on near the Atlantic seaboard and creating a rate structure unduly favorable to Chicago and the Middle West, as well as one unduly prejudical to intermountain destinations. The logic of the decision has never been overthrown, and it simply beclouds the issue to complain in generalities about the failure to recognize water competition as a just ground for permitting the establishment of subnormal terminal rates lower than to intermediate points.

In the final analysis the executives' declaration of policy touches bedrock where it concedes that so far as

any service competitive with rail service is "legitimate and a natural economic development the railroads have no right to complain." At present they have undoubted grievances—in having to confront unregulated competition, in public subsidies to their competitors, in the prospect of wasteful largesses upon projected inland waterways. But they should slough off the infirmities which they are themselves responsible for. In the long run the fittest survive. Unfair preference may be lucky for a day, but low transportation costs keep the bank and will win in the end.

Consolidation Difficulties and Prospects

The ultimate dominance of low cost in transport raises the issue with which this survey began—to wit, railroad consolidation and its bearing upon cost of rail transportation service. The origin of the consolidation provisions in the transportation act of 1920 ought not to be forgotten. It was assumed, wholly without adequate supporting evidence, that enormous economies were inherent in consolidation and that the realization of these economies would be translated into a marked abatement of railroad charges. It was hoped that the hundreds of short lines, many of which were weak financially, would be rescued from their predicament by being engrafted parasitically upon the larger consolidated systems. The recapture clause was contrived to give the short lines a high nuisance value with which to bargain for inclusion in the larger systems. Recapture of excess earnings was not expected, by Senator Cummins at least, to continue after consolidation had done its perfect work.

Experience since 1920 has demonstrated how ill-founded were the legislative views upon which the consolidation plan was based. The possible economies from consolidation, though impressive in absolute amount, have been shown to be comparatively modest. To their credit it must be said that the railroad representatives have admitted, publicly and privately, that economies contingent upon consolidation give little ground to warrant an abatement of the rate level. Moreover, recent experience has demonstrated that the notable economies achieved since 1920 have largely been made independent of the unification of properties. Heavier power, larger cars, increased efficiency in the use of coal, increased speed in the movement of freight trains, more efficient car distribution and hundreds of other minor economies have owed comparatively little to enlarged mileage under unitary control.

Indeed, in some respects the consolidation provisions of the law have had a detrimental effect. They injected a new element of uncertainty into the plans of management and aroused apprehension in the minds of thousands of railway employees. The eventual location of shops, the creation and development of terminals, the appropriate additions and betterments to be undertaken could not be intelligently planned when managements were wholly in the dark as to the composition and extent of the larger system of which they might ultimately become a part. Far from banishing the speculative element in railroad policy, they accentuated it. Executives and directorates felt compelled, in self-protection and protection of their stockholders, to fortify their position and to make strategic purchases, leases and alliances. Operatives were put on tenterhooks as to their seniority rights and even the permanence of their residences, if they were to become part of a new and alien super-organization.

The so-called final consolidation plan promulgated by the Interstate Commerce Commission in December, 1929, contained bizarre elements which seemed to make the general consummation of consolidation still more remote. It was a veritable apple of discord thrown into the group of executives. The four-system plan to which they have been induced by President Hoover to assent cuts squarely across the commission's plan. For the commission now to recede means reopening the endless hearings which terminated in December, 1923. If, upon the application of any one of the proposed big four systems, the commission makes essential changes in the set-up, where will the three remaining giant powers be left? Will they still be bound to their original agreement? These and countless other matters make the outcome unpredictable.

The conclusion to be drawn is, I think, this: There are some economies inherent in consolidation. While not overpowering, they are important enough to approve their realization—this for the support and invigoration of the railroads now sorely beset. The struggle that has gone on between them in securing control by lease, stock purchase and trackage rights has been motivated primarily by the desire to capture the traffic volume of the roads annexed, and secondly, by the desire to secure needed additional rail routes over which operating costs may be lowered. The prospective systems have agreed to assume any burden which inheres in taking over connecting short lines, some of them of doubtful value. If consolidation is to prove of its maximum benefit to the large systems it will be because it will free them from internal rate retaliations, from the fear of the big tonnage producer, from the blight of the Clayton act, and from the ever-present disquietude and uncertainty of new and disruptive combinations of rail rivals.

Heavy railroad construction in West Virginia: the Nicholas, Fayette & Greenbrier Railroad, built jointly by the New York Central and the Chesapeake & Ohio

Louisville Bridge over the Ohio River, which introduced the revenue bond method of public financing

Toll Bridges During the Past Decade

Ten-year period beginning about 1920 has witnessed a rise and decline of the private toll bridge in public favor and the growth of a publicly owned toll bridge plan involving the use of revenue bonds

By FRANK M. MASTERS
Modjeski, Masters & Chase, Consulting Engineers, Harrisburg, Pa.

SINCE the early pioneer days of the Conestoga wagon and our first highways, we have had before us the question of toll charges on highways, ferries and bridges. Today the question is largely centered on bridges, and because of the growth and spread of vehicular transportation, the problems created are more compelling than ever before. Toll bridges within the past decade have passed through a wholly unique development. The private toll bridge has experienced a complete cycle involving trial, promotion, attack and decline. From almost complete inactivity in 1920, private toll bridge construction rose until 24 structures were built in 1927, followed by such a precipitate drop that no new projects are being contracted at the present time. The publicly owned toll bridge, on the other hand, has in approximately the same period entered upon a growth that is still on the upward trend and at present is experiencing considerable acceleration because of the unsatisfactory situation in respect to private toll bridge financing.

The current toll bridge question is one of varied aspects. Private financing is at a standstill, from a number of causes. Unsatisfactory earnings on many of the existing structures have had a sobering influence on bankers and investors. Uncertainty with regard to pending legislation in Congress and a chaotic condition in the granting of franchises by federal and local governments also have produced a dampening effect on private toll bridge plans. The publicly owned toll bridge, financed by revenue bonds, is gaining favor largely as a result of the successful activities of the Port of New York Authority and the Louisville bridge commission. The immediate future points to a growth in this type of toll bridge financing. There is also an earnest desire to correct abuses in the private toll bridge field, so that the methods of financing and of granting franchises may be placed on a fair basis, and the private investor's stake in these structures guarded more effectively. If this can be accomplished along proper lines, there is reason to believe that further activity may develop in the construction of private toll bridges, which often are economically justified, and frequently, in the absence of the ability or desire to enter upon a program of public toll bridge construction, offer the only means through which needed bridges can be built.

Developments over the past ten years will have an important bearing on the toll bridge construction of the immediate future. Consequently they require careful analysis by those considering such construction.

The magnitude of the toll bridge question may be most

The successful privately owned Tacony-Palmyra Bridge at Philadelphia

easily established by citing some of the statistics that are available. A recent report of American Engineering Council's committee on bridge legislation stated that on Aug. 1, 1930, the number of toll bridges in operation was:

Publicly owned	62
Privately owned	234
Total	296

Compared with the situation on Oct. 1, 1927, the above figures represent an 18 per cent increase in privately owned toll bridges and a 32 per cent increase in publicly owned bridges. The report states that "prior to 1920 there were only two or three toll bridges built per year. In 1920 there were five, which number increased to 24 in 1927. In 1927 the return upon the investment from the privately owned bridges averaged 13.9 per cent; the return from publicly owned, 8 per cent. The total investment in toll bridges was then divided as follows:

Publicly owned, in operation	$45,178,000
Publicly owned, under construction	74,530,000
Publicly owned, proposed	58,243,000
Privately owned, in operation	73,176,000
Privately owned, under construction	41,293,000
Privately owned, proposed	254,710,000
Total	$547,130,000

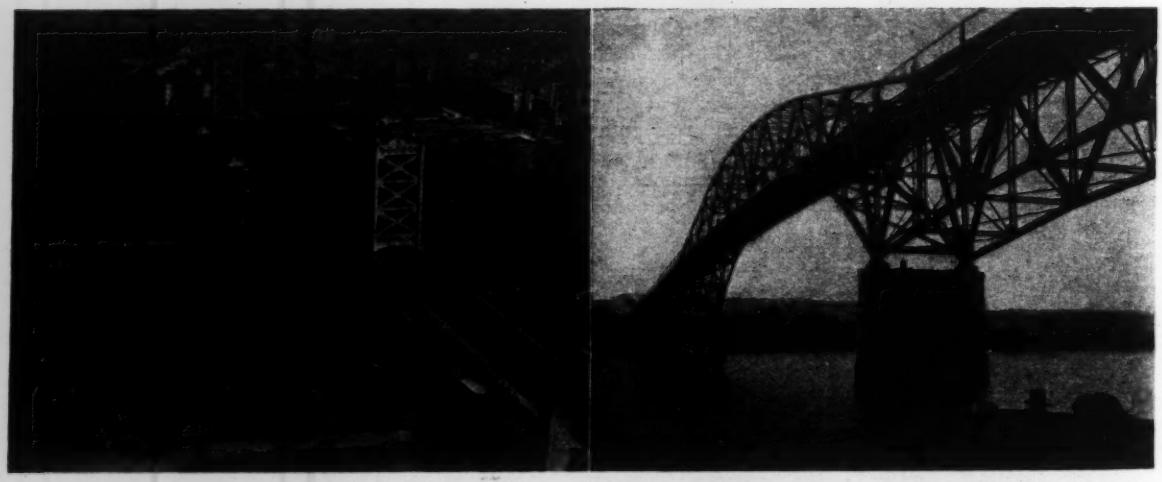
"For the bridges in operation, both privately and publicly owned," the report states, "the capital invested was $183,354,000. The operating cost for all of these bridges was $13,809,000, or 11.7 per cent of the cost." Additional data on existing toll bridges were given by P. K. Schuyler in *Engineering News-Record*, Dec. 4, 1930, p. 880.

The above tabulation not only shows the large amount of capital invested in toll bridges, but, by the totals given for bridges under construction and proposed, indicates the unparalleled magnitude of building and promotion activities in the several years just past. Unfortunately, due to the over-promotion of many of the private projects, the decline in the price of their securities, failure to earn interest payments in some instances and a growing antipathy on the part of the public toward privately owned toll bridges, much of the huge volume of proposed private construction will not materialize. The reasons for the existence of this present situation are important. Something of the history of toll bridges will throw light on the causes.

Evolution of the Private Toll Bridge

The Early Period—Long before the present era of toll bridge building, there were many privately owned toll bridges in the United States, some of them 100 years or more old. Among some of the better known of these old structures are the Eads and McKinley bridges at St. Louis, the numerous bridges over the Susquehanna River, such as the Columbia-Wrightsville, the Market Street at Harrisburg, the Clarks-Ferry and the Havre de Grace bridges, the Niagara Falls bridges, the bridges over the Delaware and Potomac rivers, the Ohio river bridges at Cincinnati, the bridges at Wheeling, W. Va., the one at Keokuk, Iowa, and the Omaha bridge.

The construction of bridges in the pioneer days was a major problem, both in engineering and finance. In order to secure bridges, perpetual franchises were often offered private promoters to provide the needed crossings. One example, which is fairly typical, will indicate that this was a necessary and logical procedure under the then-existing circumstances. At Harris Ferry, now Harrisburg, Pa., the highway connecting Reading and Carlyle converged with the highway from Lancaster to the west and north. The traffic over these two highways soon created a demand for a bridge to replace the ferry over the Susquehanna River at Harrisburg, but the required cost of $200,000 was far too much for the governmental body to finance. Finally, a few public-spirited citizens organized a company to build this bridge, and Theodore Burr designed the now historic and famous camel's-back wood-truss bridge and built it at a cost of $192,138. The company was unable to raise sufficient capital through the sale of its common stock, and the state, recognizing the necessity for the bridge, gave the company a perpetual franchise and purchased sufficient stock with state funds to complete the financing. The bridge, finally opened to traffic as a toll bridge in 1817, has been continuously operated as a private venture,



Two notable publicly owned toll bridges

The Philadelphia-Camden (left), one of the earlier bridges of the present period, has been very successful. The Lake Champlain Bridge (right), between New York and Vermont, is a recent addition to the list.

Toll houses at Clarks Ferry Bridge (left) and Louisville Bridge (right)

with an average annual return of about 4 per cent. Similar situations appear in the history of other early toll bridges, which indicate how many of the existing toll bridge projects were the logical outcome of necessities of a period quite different from the present.

The Modern Period—With the development of automobile traffic about 1910, the demand grew for new and better bridges, both ferries and existing bridges in many locations proving inadequate. State funds were needed for building highways to connect county seats and the many unrelated county road systems. Also in many cases state funds could not legally be spent for bridges. With the closing of the World War the various states and the federal government had recognized the problem that the growing automobile traffic was creating, by setting up state highway departments and the U. S. Bureau of Public Roads to lay out and construct systematic networks of highways. The first necessity recognized by the state highway departments was the accumulation of traffic data on which to base the size, location and capacity of new highway routes. Publication of highway maps and traffic data resulting from these studies gave positive proof not only of the need for highways but clearly pointed to the necessity for building bridges. Unfortunately, however, the state legislatures did not appreciate the latter necessity and as a rule left the construction of bridges to the local political subdivisions. Since most of the bridges to be built were very costly, it proved impossible to raise sufficient funds by tax levy, so that the old bridges were left in place on the improved highways.

This situation, coupled with the excellent traffic studies which were available, interested private capital in the possibilities of toll bridges. Also, companies operating old toll bridges, which had never enjoyed prosperity before, were now enjoying unprecedented business, as is shown by the accompanying traffic-volume curves for two representative bridges. The result was that several large toll bridge structures were built, and with their success demonstrated the private toll bridge building era began in earnest.

The Bear Mountain Bridge, built in 1923 by a private company under acts of the New York legislature providing for recapture, should probably be considered the pioneer structure of the current private toll bridge period. This bridge was followed by the Philadelphia-Camden bridge, which, although a public enterprise, had a remarkable effect in stimulating private toll bridge building. Other private bridges which followed these two pioneer structures in rapid succession are listed in the accompanying table.

PRIVATE TOLL BRIDGES

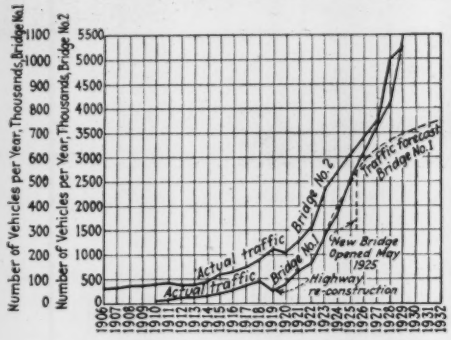
Name of Bridge	Location
Clarks Ferry	Susquehanna River
Harrisburg	Susquehanna River
Carquinez	Near San Francisco
Dumbarton	San Francisco Bay
Antioch, Calif.	San Joaquin River
Gandy	Tampa Bay, Fla.
Peace	Niagara River, Buffalo
Mobile Bay	Mobile Bay, Ala.
Ambassador	Detroit
Columbia River	Longview, Wash.
James River	Virginia
Paducah, Ky.	Ohio River
Vicksburg, Miss.	Mississippi River
Bellefontaine, Mo.	Missouri River
Chain of Rocks	Mississippi River, St. Louis
Cape Girardeau, Mo.	Mississippi River
Cairo, Ill.	Mississippi River
Sandusky Bay	Sandusky Bay, Ohio
Mount Hope	Near Providence, R. I.
Tacony-Palmyra	Delaware River, Philadelphia
Bay Bridge	San Francisco Bay
Point Pleasant, W. Va.	Ohio River
St. Marys, W. Va.	Ohio River
Fort Steuben	Ohio River
Madison, Ky.	Ohio River
Longview, Wash.	Columbia River

Private Bridge Promotion—Private capital was at first wary about toll bridges and demanded unusual terms and the utmost conservatism in financing, with the result that the first bridges had sound financial set-ups. A toll bridge, if successful, is a very attractive investment, with a practically fixed sum invested, and enjoys almost fixed operating costs and constantly increasing earnings. These attractive features interest the private investor, and the privately owned toll bridges were financed by means of first-mortgage bonds, debentures and preferred stock, which were sold to the public, and common stock, which was generally retained by the owners of the project. In some cases, common stock was given as a bonus with the purchase of the senior securities. In such cases, as a rule, however, the owners retained control through a majority ownership of the common stock. In the more conservatively financed privately owned toll bridges, the owners have put in cash, property, or eliminated ferry competition in exchange for the common stock, thus placing a real value behind the common stock. In some cases, however, the owners have made no cash investment and have had little to lose, while the earnings were being applied to the retirement of the fixed obligations. After the retirement of the fixed obligations the property will be owned solely by the common-stock holders, and all net earnings will go to them as dividends.

The constantly increasing auto traffic and the records available from the existing successful bridges, coupled with a dissipation of some of the caution used by bankers on the early bridges, made these bankers willing to buy bonds and sell them to the public on estimated earnings based on traffic surveys. Some of these surveys were

very conservative and sound. Others, however, have proved to be the wildest kind of guesses. The easy-money period just passed and over-enthusiasm on the part of the investing public resulted in many millions of dollars worth of securities being bought from the bankers and the construction of numerous large bridges. Some of these at present are not financially sound due to over-estimation of the traffic, too high toll charges, ferry competition or parallel free bridges.

Another abuse grew out of securing and trading in Congressional permits issued for bridges over navigable waters. The Constitution of the United States gives to Congress the right to control the navigable waters. Congress, through the river and harbor act of 1899 and the general bridge act of 1906, delegated to the chief of engineers, U. S. Army, and the secretary of war the right to approve plans for all bridges or other construction within the navigable waters, in order that such construction should be regulated so as not to obstruct free navigation. Such approval, however, can only be given after Congress has passed an act especially authorizing the construction, unless the navigable body of water lies wholly within the boundaries of one state; under which circumstances, in accordance with the 1899 act, it is not necessary to have an act of Congress for the construction of a bridge, but the construction must be approved by the chief of engineers and the secretary of war.


Number of Vehicles per Year, Thousands, Bridge No.1
Number of Vehicles per Year, Thousands, Bridge No.2
Actual traffic Bridge No.1
Actual traffic Bridge No.2
Traffic forecast Bridge No.1
New Bridge Opened May 1925
Highway re-construction

Traffic-growth curves chart modern period

The boom which these two privately owned Susquehanna River bridges in Pennsylvania have enjoyed since 1920 is typical of many other structures.

Such trading in federal authorities caused much unfavorable comment from the public, and the attention of the highway departments and the Bureau of Public Roads was drawn to the fact that river crossings, located frequently on federal-aid roads and state highways, were being exploited for the benefit of a small group of individuals. When the attention of Congress was brought to the fact that holders of these permits were buying and selling them as though they were franchises, Congress began giving its consent to more than one party, including states and cities, to build bridges at the same location, the attitude being that the bridges were needed and anyone who would build them could secure Congressional consent. This attitude, while effectively stopping the bartering in the permits, was subsequently made impotent by placing certain Congressional restrictions on the financing and construction of bridges, including provisions for recapture. This, in effect, gave a franchise, a power which it is believed should rightly lie in the hands of the state highway departments in the case of intra-state bridges, or in the municipality in the case of city bridges, and with the Bureau of Public Roads in the case of interstate bridges.

One of the most important statements on the toll bridge question that has been made is the recent report of American Engineering Council's committee on bridge legislation. This report, while commendable in detail, is in the writer's opinion based on a mistaken premise—namely, that Congressional legislation is necessary, and that authority rests in Congress for regulating both the construction and financing of toll bridges.

Under the present federal bridge act of 1906 Congress exercises necessary authority over navigation clearances in a satisfactory manner through the chief of engineers and the secretary of war. In granting bridge franchises Congress assumes jurisdiction over the financing of bridges and, in effect, over the selection of bridge sites. The authority for the franchise, the location and capacity of the bridge and the control of the finances of a bridge company, either privately or publicly owned, should lie within the states or municipalities concerned. These states are investing many millions of dollars in their highway systems and should have the right to say whether or not a toll bridge should be built at a certain location. They should also have the right to pass on the plans and specifications for the bridge to make sure that it is safe and of adequate capacity.

Private Bridge Decline—Due to over-financing, unwise promotion and expensive construction costs, the total cost of many projects has been so great that the estimated traffic has had to be multiplied by large toll charges to produce sufficient revenue to carry the financing and pay the costs. With such necessary high toll rates in existence these bridges have not been able to meet competition of already existing ferries operating at a lower rate of toll. The result is insufficient income to carry the securities outstanding against the project. In still other cases the political subdivisions, which encourage private capital to come in and build toll bridges, have turned around and built parallel publicly owned free bridges, making the securities outstanding in the hands of the investors practically worthless.

A number of the privately owned and financed toll bridges built during the past few years have failed to earn the interest on even the first-mortgage bonds. This failure of many of the large bridge projects, together with the present depressed condition of the security markets, makes it extremely difficult, if not impossible, to interest the investor in any type of privately owned bridge financing.

Along with these conditions there has been a constantly growing agitation on the part of the public to eliminate the privately owned toll bridges from the publicly built and owned highway systems. The motoring public is opposed to the collection of tolls for the benefit of the individual investor. The highway departments in various municipalities are opposed to the construction of any but publicly owned bridges. The net result is that private bridge financing is at a standstill and even badly needed structures cannot be financed.

Public Toll Bridges

It is a fact that the need for bridges is even greater now than it was at the height of the private toll bridge development. The demand of the public for the construction of bridges is gradually crystallizing into a development of public financing of toll bridges. Due to the high cost of these structures and the inability to use public or tax funds to pay these costs, a type of bond issue has developed on which the revenues from tolls are pledged to pay the interest and sinking-fund charges; the securities are known as revenue bonds. These bonds are issued as a moral obligation of the

HUDSON RIVER BRIDGE
UNDER CONSTRUCTION
AT NEW YORK

Engineering News-Record, February 5, 1931

political subdivisions constructing the bridge and are income-tax free, as well as free from local tax, thus having most of the advantages of a municipal bond.

The revenue bond has been used a great deal for financing municipally owned water-works, power plants and similar public works in the past. A plan similar to the revenue bond plan was used by the Port of New York Authority for financing the cost of the toll bridges built and under construction in New York at the present time, except that there is a small cash appropriation from tax funds in addition to the bridge revenues as security for these bonds. The Ohio River bridge at Louisville, Ky., represents possibly the first example of the use of revenue bonds in the bridge field. These bonds were bought by bankers under an agreement that the city should build, own and operate the bridge and that the net revenues be placed in the hands of a trustee who would pay operating costs, maintenance and the interest and sinking fund charges on the bonds. It was not necessary to submit this proposal to the voters, as it did not create a tax obligation; and the necessary state legislation, authorizing the city to issue the bonds and creating a bridge commission to be appointed by the mayor, was speedily passed. The bridge has now completed its first year of successful operation.

Market Street Bridge, Harrisburg, Pa.

A private bridge which carries 6,000,000 vehicles annually at a toll charge of 5c.

The revenue bond type of financing of toll bridges has many advantages, since the bridge belongs to the political subdivision issuing the bonds. As soon as the bonds are retired the bridge becomes free. Compared with the type of bonds issued by private corporations, revenue bonds carry a low interest rate; also they sell as a semi-municipal bond. Other advantages are that the bridge is operated economically, without profit, and is free from taxes, so that all earnings after operation and maintenance charges can be applied to interest and amortization.

Some actual cost figures will indicate some of the economies which a publicly owned toll bridge holds over one that is privately financed. In the accompanying table are listed the items of capital account, cost and the fixed annual charges for a privately owned and successfully operated toll bridge.

DATA FOR A SUCCESSFULLY OPERATED PRIVATE TOLL BRIDGE

Capital Structure		Original Cost		Annual Fixed Charges	
Bonds, 6½ per cent	$1,500,000	Construction	$1,122,000	Bonds	$97,500
Pref. stock, 7 per cent	500,000	Engineering	82,000	Pref. stock	35,000
Com. stock	50,000	Real estate	53,000	Oper. cost	50,000
		Expense during construction	170,000	Taxes	15,000
		Finance and promotion	140,000		
		Toll houses	3,000		
		Equipment	3,500		
Totals	$2,050,000		$1,500,000		$197,500

In order to effect a comparison between this well-operated private bridge and a bridge financed by revenue bonds, it may be assumed that the public bridge will cost the same, although it is probable that financing and promotion costs and expense during construction will be somewhat less than the amounts given in the table for the private bridge. On the public bridge the annual fixed charges will be as follows:

Bond interest, 4½ per cent of $1,500,000	$67,500
Operating cost	35,000
Total annual fixed charges	$102,500

There is thus seen to be an actual saving of $80,000 a year in fixed charges and $15,000 a year in the operating costs over the private bridge. Assuming the same volume of traffic and the same toll charges for the two bridges, $95,000 more per year could be applied to the retirement of bonds on the public bridge than on the private bridge.

Public and private toll bridges can also be fairly compared by examining the ratio of fixed charges to cost. For the above two structures, one an actual private project, the other a fictitious public bridge, the respective ratios are 13.2 per cent and 6.8 per cent. The Louisville bridge affords an actual example. Its total cost was $4,768,000. The expense budget for 1931 (which cannot be exceeded) is $70,700, and the bond interest (4½ per cent of $4,750,000) is $213,750, giving total fixed charges of $284,450. The ratio of fixed charges to cost then is 6 per cent, again much smaller than the private bridge.

Since the financing and construction of the Louisville bridge, the plan of revenue bond financing has become very popular and has been adopted by various states and municipalities for the construction of many badly needed bridges and for the purchase of existing privately owned structures. States that have authorized bonds of this same general type for toll bridge purchase and construction in recent years include Tennessee, Alabama, Arkansas, Kentucky, West Virginia and California. In addition to the Port of New York Authority bridges and the Louisville bridges, the Lake Champlain Bridge, built by a joint New York-Vermont commission, is the outstanding individual project which has utilized this type of financing.

Among the states Kentucky has probably gone farthest in its utilization of revenue bonds. Recently $9,682,000 worth of 4½ per cent bonds were sold under the supervision of the state highway commission under an indenture calling for the elimination of competition from existing bridges or ferries and the maintenance of the new structures from other than bridge revenues. The proceeds of this bond issue are being used to construct eight intra-state bridges over the Kentucky, Green, Cumberland and Tennessee rivers, a bridge over the Ohio River between Maysville, Ky., and Aberdeen, Ohio, and a bridge over the Ohio River between Ashland, Ky., and Coal Grove, Ohio, and to pay one-half the cost of a bridge over the Ohio at Evansville, Ind. If the proceeds from the bond issue are insufficient, the bridges will be completed from the state road fund. They will become part of the primary highway system of the state, so that every advantage will be afforded traffic to use them. The bridges will be operated by the state highway commission.

Natural Gas

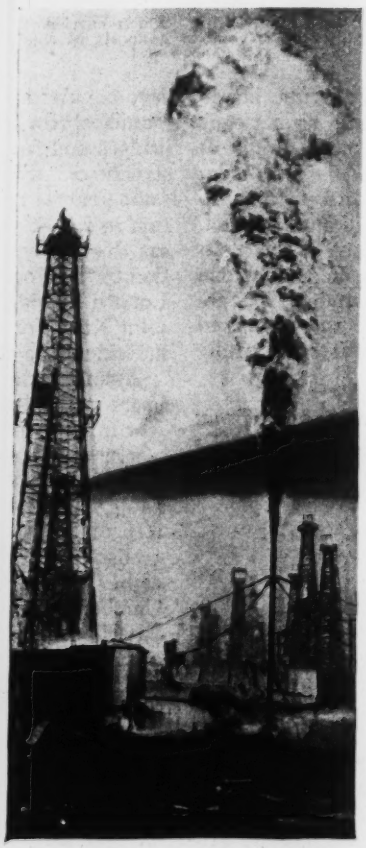
An Appraisal of Its Accomplishments and Future

An account of the development of a new industry in the field of an old fuel, setting forth the modern aspects of production, transmission and marketing that have made natural gas available in 36 of the 48 states of this country

By W. G. VON GEMMINGEN
Consulting Engineer, New York, N. Y

NATURAL GAS in the short period of five years has assumed a position of commanding importance to industry and engineering. As a prime-mover fuel, it is a worthy rival of water power. As a heating fuel, it has displaced coal and oil in many communities. The building of pipe lines, some 1,000 miles long, has made this old but rejuvenated fuel a potential source of power and heat in nearly every community in the United States.

The rapid increase in the available supply of natural gas and the unprecedented extension of its availability raise numerous questions. Can we depend upon the supply to last? Are new supplies being discovered? What is the economic basis and background of this industry that has furnished the principal high spot of activity in a year of depression in other fields? What does it cost to produce and to market natural gas? Can we expect it in our homes, or will industrial plants reap its benefits? How much farther can we expect natural gas to be piped from its sources of supply? What about pipe materials and pressures? What, in brief, has been accomplished and what does the future hold? The writer has attempted herein to answer some of these questions in as brief and analytical a manner as possible.



Natural gas is by no means new. Its industry was born during the late 70's or early 80's in western Pennsylvania and eastern Ohio—about the same time that the oil industry, to which it was closely related, began to flourish. The gas fields developed coincidentally with the search for oil, and for years gas was regarded as a byproduct, used for drilling wells and for fuel in near-by towns. Natural gas was so cheap, plentiful, and so casually looked upon that probably more of it was wasted in the early years of its development than was used. As late as 1902 the writer saw miles of countryside in the vicinity of Pittsburgh, Pa., illuminated by gas flames shooting from the ends of open pipe. No one bothered to shut the gas off, and it was generally assumed that the supply was inexhaustible. However, with the acquisition of great tracts of oil and gas lands in Pennsylvania, Ohio, and West Virginia by Standard Oil interests, the waste of natural gas was curtailed. The Hope Natural Gas Co., Peoples Natural Gas Co., East Ohio Gas Co. and others came under Standard Oil control. Millions of dollars were invested in natural gas, and organizations were developed to handle the problems peculiar to the new industry.

Pittsburgh and Cleveland capital backed such organizations as Equitable Gas Co., Logan Gas Co., Ohio Fuel Co., United Fuel Gas Co., Oklahoma Natural Gas Co. and the Lone Star Gas Co., in Ohio, West Virginia, Pennsylvania, Oklahoma and Texas; while the Empire Gas Co. of Kansas was sponsored by H. L. Doherty & Company—to mention some of the older companies which reached positions of prominence in the natural gas industry prior to 1920.

Up to 1923 natural gas development was financed largely through interests identified with the oil industry, who were accustomed to speculating. In the meantime, important changes had taken place in the economic thought of America, the doctrine of conservation had become established and nearly all natural gas producing states had passed laws designed to prevent its waste and had installed legal machinery to enforce these laws. Also at about this time vast sums of money were expended in a search for oil. The press of the country carried predictions of the rapid exhaustion of the oil supply. As a result, new aids to petroleum geology were developed and improved methods of drilling adopted to the end that the average depth of wells increased from about 2,500 to nearly 5,000 ft. At the present time numerous test wells have been put down to 7,500 ft., and one or two to 9,000 ft. This contributed to the discovery of hitherto unknown natural gas supplies, while the state conservation measures gave assurance that these reserves would be maintained intact for use of pipe lines.

Opportunities for investment in natural gas projects came to the attention of investment bankers generally, resulting in a new era of public financing in the natural gas business. At first the development of natural gas under-

takings was confined to comparatively small projects requiring from about one to five million dollars, and supplying gas within a radius of 100 to 200 miles of the fields. This condition was followed by consolidations into natural gas systems whose pipe lines covered large areas, often extending across state lines. And recently great utility holding organizations have acquired control of natural gas companies with capitalizations running into hundreds of millions of dollars. New supplies of natural gas have been developed and new pipe lines a thousand miles or more in length are under construction.

Within the past ten years many new gas fields have been discovered. Among the more important are:

Field	Location
Monroe-Richland Parish	Northern Louisiana
Refugio	South of Houston, Tex.
Laredo District	Laredo, Tex.
Cole and Carolina	Laredo, Tex.
Amarillo	Panhandle of Texas
Hugoton	Stevens County, Kan.
Baker-Glendive	Eastern Montana
Sweetgrass	Northern Montana
Viking	Alberta, Canada
Kettleman Hills	Near Fresno, Calif.
Button Willow	Near Bakersfield, Calif.

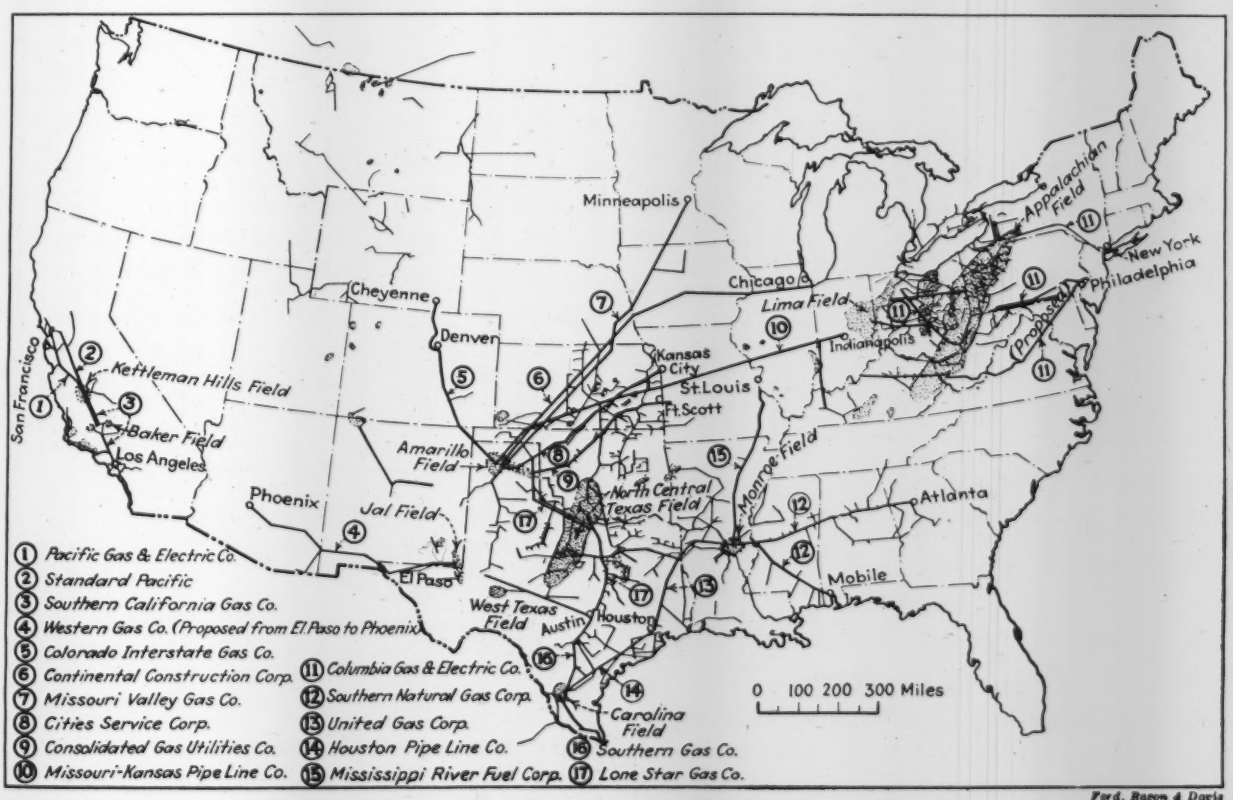
The Amarillo field is the largest known single gas field in the world. In addition to the above, other important gas fields have been developed in California and in the vicinity of Calgary, Canada. Geologists' reports indicate the new supply of gas discovered in the Laredo District, Refugio, Monroe-Richland Parish, Amarillo, Hugoton and Baker-Glendive fields, totals about 25,500 billion cu.ft. Since these reports were made, additional supplies have been added through extension of the fields and the discovery of deeper sands.

There are now two prospective gas areas in the process of development which are interesting to the natural gas industry because of their location in proximity to the great industrial and domestic gas markets of eastern Pennsylvania, New Jersey, New York and New England. They are located near Watkins Glen in New York State and in Tioga County, Pennsylvania.

Functions of the natural gas industry group themselves under the three major subdivisions of production, transmission, and distribution; and sound natural gas projects are predicated on the following essential factors:

1. An adequate supply of gas, combining in proper degree, quality, cost of production, and rock pressure.
2. A market of sufficient magnitude, at an adequate price for gas, with prospects for future development, protected from probability of abnormal competition, coupled with diversity of demand and economic load factor
3. A pipe-line system efficiently constructed and managed, susceptible of economical expansion, safeguarded against interruption of service with a flexible capital structure to protect the property from unforeseen future competition from new sources of gas supply more favorably located with reference to the markets to be served, and of such total cost as will attract capital to the project through reputable agencies experienced in financing natural gas properties.

It is not within the province of this discussion to explain the theory of the origin of natural gas accumulation underground, methods of production, estimation of gas reserves and similar subjects. Natural gas is a mechanical mixture consisting largely of hydrocarbons, principally methane CH_4 and ethane C_2H_6, having a specific gravity ranging from about 0.55 to 0.89 and averaging about 0.65 (air = 1). Its heating value per cubic foot, measured under standard conditions, varies from about 900 B.t.u. to more than 2,400 B.t.u. in rare instances. A fair average for the Appalachian field is about 1,130 B.t.u.; for Louisiana, about 1,020 B.t.u.:



Present network of pipe lines indicates wide availability of natural gas

Worthington Pump Photo

Compressor stations at 100-mile intervals on large lines

Such a spacing permits placing other stations midway between original stations when needed. Usual pressures on modern lines are 300 to 500 lb. per sq.in.

and for the Texas fields about 1,000 B.t.u. per cubic foot.

The cost of natural gas production varies with many factors, some of which are the size of the wells, depth of producing horizons, character of drilling, distance from water and transportation facilities, character of gas-bearing formations, which affects the ratio of dry holes to producing wells, and the susceptibility of producing wells to loss through sanding up, cratering, etc. In general, natural gas is produced in the Appalachian fields at an approximate cost of from 5c. to 15c. per thousand cu.ft.; in Louisiana for about 2½c. to 3c.; in Laredo and the Gulf Coast of Texas for about 2½c. to 3c.; and in the Amarillo field for about 2c. or less.

Drilling of average wells in the Appalachian fields costs from $8,000 to $15,000; in the Laredo District about $12,000; in western Oklahoma from $50,000 to $75,000 (for 3,000 to 4,000-ft. wells); and from $18,000 to $20,000 in the Amarillo field.

Gas wells in the Appalachian fields and in Oklahoma, Kansas, north and central Texas, can be drawn on for from 20 to 50 per cent of their open-flow capacity, while those along the Gulf Coast are rarely pulled to more than 5 to 15 per cent, on account of the danger of damaging the well by an influx of water or by cutting out the screens by particles of sand. Some states have laws limiting the draft on a well to 25 per cent of its open-flow capacity. (Open flow is a term used to designate the size of a gas well and means the quantity of gas any well could produce if the flow were unaffected by any resistance except that of the sand and atmospheric pressure.)

Natural gas is found at varying pressures, designated by the term "rock pressure." These pressures vary in different gas fields and with different sands in the same gas field. Shallow gas fields may have pressures as low as 100 to 200 lb., while some fields have pressures of 2,000 lb. and more. From about 400 to 1,200 lb. represents the usual range of pressures found in a majority of natural gas producing areas of this continent.

Marketing Problems

Natural gas markets vary with the climatic conditions and industrial characteristics of the territory in which they are located. In making surveys for the purpose of forecasting gas sales, too much stress cannot be laid upon the importance of obtaining intelligent, accurate, comprehensive data. Wide practical experience in many industrial operations, coupled with both practical and theoretical knowledge of burner and furnace design, experience in the combustion of all kinds of fuels in connection with furnace tests, heat and weight balances, together with some knowledge of pipe-line operation, form an excellent background for this kind of work.

In Houston and San Antonio, Tex., to supply a rough illustration of the effect of climatic conditions on gas sales, the average domestic consumer uses from 40,000 to 50,000 cu.ft. of gas per year; while in Oklahoma this average increases to about 100,000 to 115,000 cu.ft. It is estimated that Sioux City, Iowa, would average 150,000 cu.ft., and Minneapolis and St. Paul, Minn., 175,000 cu.ft. Edmonton, Canada, uses over 200,000 cu.ft. per consumer anually. These figures are indicative of the effect of climate on domestic gas consumption at a retail price of about 70c. per thousand cu.ft.

Industrial markets vary considerably. (The term "industrial gas," as usually used, refers to gas supplied in quantities of from one-half million to 60 million cu.ft. per day, or more, in a single plant.) In Texas and Oklahoma, power houses, cement plants, oil refineries, brick and tile plants, zinc smelters, gypsum plants, sugar mills, are large users of natural gas. In Kansas, salt plants and packing plants may be added to this list, while in Ohio, Pennsylvania and Michigan, steel mills, automobile factories and glass plants are among the consumers.

Experience has taught that where one or two consumers take a large percentage of the pipe-line deliveries, or where several plants in the same or closely allied industries take the bulk of the industrial sales, the risk of business depression or of altered conditions in the particular industry warrants a higher rate of earnings for the gas property than would be the case where diversification of market prevailed. Consolidations and interconnection of pipe-line systems over large geographical areas have a tendency to offset this condition. From a standpoint of stability of earnings a considerable percentage of domestic business is desirable. This, however, carries with it the penalty of poor load factor and an obligation to prior service, which may prove a handicap to retaining choice industrial business, particularly where the house-heating peak loads are large Some gas sales statistics are given in the accompanying tables.

With the supply of gas assured, say for twenty years, or more, and the size of the market and the price at which gas can be sold determined by a market survey, a gas sales campaign is inaugurated. Financing of the project is usually arranged by the time sufficient gas to insure a 6 per cent return on the money required has been contracted for. Experience has taught bankers familiar with financing natural gas undertakings the advisability of devising a flexible capital structure so as to be able to keep pace with the growth of the industry.

Load Factors—Industrial pipe lines usually operate under a load factor ranging from 70 to 85 per cent; whereas, the average domestic load factor, including house heating, is about 40 per cent. The typical average annual load factor of natural gas systems operating in the latitude of Pittsburgh, Pa., varies from 50 to 60 per cent, where the ratio of industrial sales to domestic and commercial sales is about unity. In general, because of the differences in load factor it is found that the profits derived from large pipe lines selling industrial gas at prices ranging from 23 to 25c. per thousand cubic feet about equal those received from selling natural gas

wholesale to distribution systems for domestic use at prices of from 40 to 45c. per thousand cubic feet.

The compressibility, coupled with the comparatively high pressures under which modern natural gas pipe lines operate, compensates in a considerable degree for the hourly fluctuations in demand for gas. Gas holders are unnecessary as storage reservoirs in natural gas practice, in which respect natural gas differs from manufactured gas.

The natural gas industry is facing two contradictory sets of marketing conditions. West of the Mississippi River the potential gas supply exceeds the demand, so that the tendency is to construct pipe lines of sufficient size to supply a high percentage (up to 75 per cent in some instances) of the potential market for gas. Also, in order to secure a large portion of this prospective market within a short time, low rates are often quoted. In the East the reverse is true. The potential markets exceed the available gas supply, and the tendency is to construct pipe lines to cater to a selective market (often as low as 10 per cent of the total market) in which gas is sold at higher prices.

GAS SALES RECORD

(For a Company Operating in the Middle West)

	Cu.Ft.	Per Cent
Total annual sales	28,000,000,000	100.0
Domestic sales, cooking and water heating	6,860,000,000	24.6
House heating	7,440,000,000	26.6
Total commercial sales	3,100,000,000	11.1
Total industrial sales	10,600,000,000	37.7
Average daily sales	75,800,000	

(The ratio of the maximum day to the average day is 2.23)

SALES BY MONTHS

	Domestic, Per Cent	Commercial Per Cent		Domestic, Per Cent	Commercial Per Cent
January	14.50	12.50	August	3.65	4.40
February	14.25	13.10	September	4.03	4.70
March	12.60	11.60	October	5.92	6.15
April	8.83	8.84	November	8.06	8.33
May	6.70	7.52	December	11.75	11.95
June	5.68	6.10			
July	4.03	4.63		100.00	100.00

How much does it cost to transport natural gas? Exclusive of the price paid for gas by the pipe-line company, the approximate total cost of transmitting gas 1,000 miles through a 24-in. pipe line is about 19c. per thousand cu.ft. This figure includes interest, depreciation, operating expenses and local taxes, and contemplates annual sales of gas equal to about 55 per cent of the annual total capacity of the pipe line. The cost for other size pipe lines ranges from 2c. to 2.5c. per 100 miles.

Gas Transmission

Without going into a detailed discussion of the principles and mathematics involved in pipe-line design, a few general statements may be made. The writer usually recommends that important pipe lines be of such size as to anticipate the probable increase in gas deliveries for a period of four or five years, at which time a minimum compressor station spacing of from 45 to 50 miles will have been reached. The compressors usually operate on a compression ratio (discharge to intake pressure) of from 1.4 to 1.75. When the capacity of the line is reached looping may be resorted to, which means paralleling the original pipe with a second pipe for part or all of the distance between compressor stations, thus reducing the resistance to the flow of gas and increasing the pipe-line capacity. In this way the capital invested in equipment is kept at a minimum, and money is spent for increased capacity only when the need has been demonstrated by experience.

Stream crossing protected by ballast clamps and expansion joint

Main trunk lines usually follow as straight a line as is possible from the gas supply to the center of gravity of the gas markets. The character and number of river crossings, swamps, rough broken topography and the existence of rock close to the ground surface are some factors affecting the location of large pipe lines. In main-line design permanence of construction, operating cost and the cost of construction are necessarily compromised to bring about the most economical solution.

Up to about 1928 lap-welded pipe with an ultimate strength of 50,000 lb. per sq.in. was used for trunk-line construction, but this type of pipe has the disadvantage that the longitudinal joint has an efficiency of only about 70 per cent, necessitating the use of heavier pipe than would be required were these joints 100 per cent efficient. Electric-welded steel pipe and, later on, seamless tubing, both with joint efficiencies approximating 100 per cent and an ultimate strength of 60,000 lb. per sq.in., were developed, with a considerable saving in the weight of material. Illustrative of the effect of this development in pipe manufacture, the unit weight of pipe used in the 22-in. Monroe-Baton Rouge line (first of the modern large trunk lines), completed in 1926, was about 100 lb. per ft., as compared with a unit weight of 78 lb. per ft. for the same size pipe in the Monroe-St. Louis line, completed in 1930. The average cost of pipe plus freight on recently constructed long pipe lines is approximately $90 per ton. Using this figure as a basis of comparison, the cost of pipe (the principal material item in any pipe line) has been reduced 22 per cent in the past few years.

If the claims of pipe manufacturers are borne out, our future large pipe lines may be constructed of material having an ultimate strength of 65,000 lb. or more, and of such improved physical characteristics as to warrant decreasing the factors of safety from about 3 or 4, now current practice, to from 2.6 to 3.25. This means either a further reduction of 25 to 30 per cent in the unit weight and cost of pipe, or the use of higher pressures.

Reports are current to the effect that a pipe line using a new high-elastic limit, cold-worked material is contemplated, in which the pipe will be stressed to 25,000 lb. per sq.in., reducing the required diameter from about 18 in. to 12 in. It is said also that this line will operate under 1,000 lb. pressure, whereas the highest pressures now used are about 500 lb., with one line tested to over 600 lb. Up to 1926, 350 lb. was considered a high pressure for a natural gas trunk line. If any or all of these improvements materialize, the cost of gas transportation will be favorably affected and the economic range of pipe lines increased.

Conservative practice dictates that pipe lines should be laid in a trench with a cover of from 24 to 60 in., depending on the size and impor-

tance of the line, and on climatic conditions. It is customary to place gate valves about every 10 miles in trunk lines to facilitate making repairs. Large pipe lines are often constructed with compressor stations spaced from 90 to 110 miles apart, with provisions for future stations to be located midway between the original installations. From 300 to 500 lb. is the usual pressure in main lines, with reduction at point of delivery to from 20 to 100 lb., to suit customers' requirements.

Electric welded and gas welded joints and Dresser-type couplings have been used on these large diameter pipe lines. All of these joints are highly leakproof. The Dresser coupling provides for contraction and expansion within the joint. On electric and gas welded lines special expansion joints are necessary at intervals as shown in an accompanying illustration.

Where major pipe lines cross large rivers a careful study should be made before the site of the crossing is finally selected. Multiple crossings are usually resorted to. These consist of a header of the same diameter as the pipe line, to which is attached two or more smaller pipes with a valve arrangement by which one or all of the pipes can be isolated in case of a break in the river lines. Also, the crossing is usually so designed that the pipe capacity will not be seriously affected should one or two of these river lines be damaged.

What of the Future?

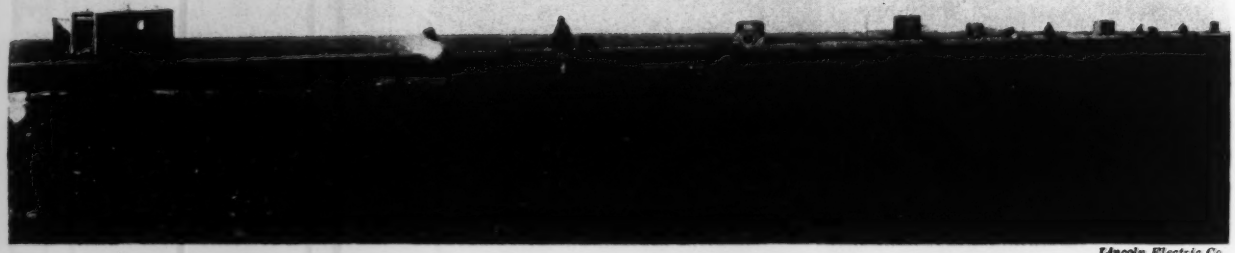
Is the natural gas business based on a sound economic and financial foundation? Will it be followed by bankruptcy and receiverships such as characterized the early period of railroad building? It would be strange indeed if some of the recent natural gas promotions were not poorly conceived and did not have difficulty in attaining anticipated earnings, particularly in cases where future earnings were predicated on surveys of industrial fuel requirements for the boom periods of 1928 and 1929. Because of a lack of public statements it is difficult to determine the effect of the 1930 business depression on the earnings of some of these companies, while the earnings of others are not segregated in the holding company reports. A review of the situation as a whole, however, shows a generally healthy condition in the industry. The reports from several large companies are expected to show actual increases in earnings for 1930 over the year 1929, and while the earning statements of some of the smaller companies may show declines their fixed charges should be earned by a comfortable margin. Speaking for several companies, which the writer is more or less qualified to judge by virtue of information gained at the time they were financed, and, assuming that they are representative of the industry as a whole, there seems to be a little danger of defaults in interest charges; and the outlook for the future appears to be excellent.

This question of the future of natural gas is of interest not only to the industry itself but to the country at large. Present indications point to further consolidations and to physical interconnections of existing pipe-line systems until many of the major gas fields will be available to a large percentage of the natural gas markets. Mixing of natural gas with manufactured and coke oven gas will become a more universal practice. A network of small pipe lines covering entire states and fed from trunk lines will supply those communities too small to support manufactured gas plants. A steady increase in the consumption of gas for both domestic and industrial purposes is anticipated, and new gas fields of importance will probably be discovered from time to time. Some of these may be so located with reference to the great fuel-consuming centers of the country that extensive markets hitherto not served by natural gas may be opened up to the industry.

The only states in which natural gas is not distributed at the present time are: Oregon, Nevada, Vermont, Minnesota, Wisconsin, New Jersey, Florida, Virginia, Maine, North and South Carolina, Massachusetts, Connecticut, Delaware, New Hampshire and Rhode Island. The year 1931 will see natural gas in five of these states, if present plans are carried out on schedule.

Three stages in pipe-line construction

Left and right, stringing pipe and ditching on 250-mile 20-in. gas-welded line from Kettleman Hills to San Francisco. Below, electric welding on new 1,000-mile 24-in. line between Texas Panhandle and Chicago.



Lincoln Electric Co.

The Drought of 1930

Subnormal rainfall, deficient in the summer months, combined with excessive heat, produced extensive crop damage in the central section of the country and brought many streams to very low stages—Data on the depletion of groundwater are still lacking

By F. H. NEWELL
Consulting Engineer, Washington, D. C.

FOR GENERATIONS the records of water in the United States have not been marked by so sensational an occurrence as the dry weather of the summer of 1930. There may have been worse droughts, but none have had a greater emotional or political effect. Vast farming regions suffered crop losses and distress, to such an extent that the federal government made numerous efforts to bring relief, and a farflung system of food distribution has been organized by the Red Cross. Efforts were made to utilize public works in rural regions—chiefly road work—as a mean of giving employment to farmers whose crops had failed. Congress later appropriated $35,000,000 as a fund from which farmers could obtain loans for stock, feed and seed. Nothing like this has come to pass in the country's history.

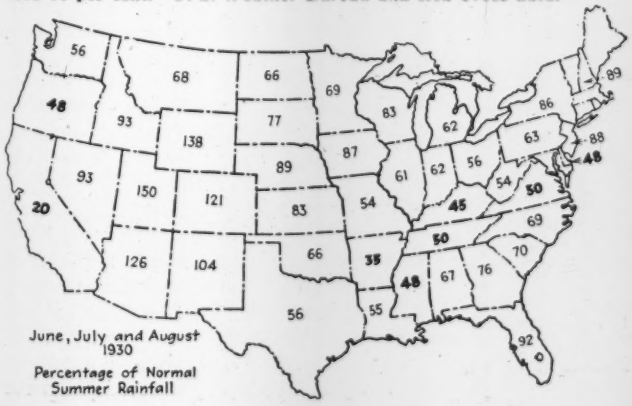
If in these aspects of public importance the 1930 drought occupies an unprecedented position, we are at once led to inquire as to its engineering significance. What is its relation to water supply, navigation, power and sanitation? Does it constitute a new datum point in hydrologic knowledge? The present article attempts to answer these questions on the basis of the incomplete data that have become available up to the present.

The answer in general terms is reassuring. Though innumerable farmers met disaster, many industries suffered directly and indirectly, new low levels in wells and streams were established and not a few water supplies proved deficient; though water power was reduced and navigation affected yet the year's departure from normal was by no means unprecedented.

Agricultural distress remain the most prominent element of the situation. Emphasized by political clamor and getting the front pages of the daily press, it created a widespread belief that the country was devastated by the drought. The fact is that some parts of the country experienced floods. The composite of the seventeen principal crops is estimated at only 5.5 per cent less than the ten-year average 1918 to 1928. Yet the severity of the agricultural effect may not be minimized. The best present figures are that corn harvested in 1930 was 20 per cent less than 1929; that buckwheat was reduced 22 per cent, grain sorghums 14 per cent and hay 18 per cent. Pasturage unquestionably suffered the greatest loss, which is the reason for the abnormal effect on livestock and feed.

Averaged over the entire country, the 1930 rainfall (25.6 in.) was 13 per cent below normal. This is the result of observations at 5,000 stations, grouped by states and weighted according to state area. But while the totals are not very striking, the localized geographic distribution of the drought and the fact that the critical shortages occurred in the growing season give the situation far greater importance.

The rainfall maps of Fig. 1 bring out both these points. The map of annual rainfall contours reveals the rather unexpected fact that the arid parts of the country were relatively wet, while the humid regions were dry;



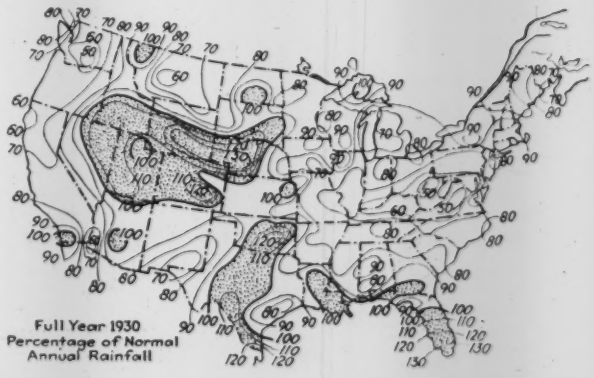


Fig. 1—Rainfall shortages in 1930 were especially marked during the summer. A period of abnormal heat made their effects acute Comparison with the upper map, which indicates the regions where drought-relief work is in progress, reveals the critical effect of excessive heat accompanied by rainfall deficiencies that approach or exceed 50 per cent.—*U. S. Weather Bureau and Red Cross data.*

rainfall above normal occurred in the Rocky Mountain and Great Basin region, but all the remainder of the country suffered a shortage.

The more important figures of rainfall distribution, however, are those given in the summer rainfall map in Fig. 1. In a broad belt trending southwestward from the Middle Atlantic area to Arkansas the rainfall of the three summer months, May, June and July, was only half the normal for these months. It is significant that the same area is the region in which the Red Cross is now carrying on its relief work.

Simpler and in some respects more instructive evidence of the severity of the summer shortage is contained in the curves of Fig. 2. The summer deficiencies for the two groups of states represented—Middle Atlantic states and the Ohio Valley-Missouri region—far exceed those of any other year within the range of the curves. The effect of the concentration of rainfall shortage was sharply intensified by a severe and prolonged period of heat during the summer, which accentuated the effect of deficient water supply.

Study of monthly rainfall figures indicates that the drought was first felt in the Middle Atlantic area, and then progressively southwestward to Arkansas. The figures by states and months are given in detail in an accompanying table covering the entire year.

The summer shortages were so great in a number of states that all prior records of low rainfall during a month were broken repeatedly. In March one state exceeded its previous record low rainfall for the month; in April, another; in June, six states; in July, nine states; in August, four states.

Not only was the drought itself unusual, but its effect upon certain agricultural areas was intensified by the fact that they were recovering slowly from the effects of previous visitations by drought or flood. The effects of the 1927 flood had not all been overcome in the Mississippi Valley region, included in one of the most severely depressed areas. In other regions the 1925 drought had lowered the ground water so much that it was not restored to anything like normal levels.

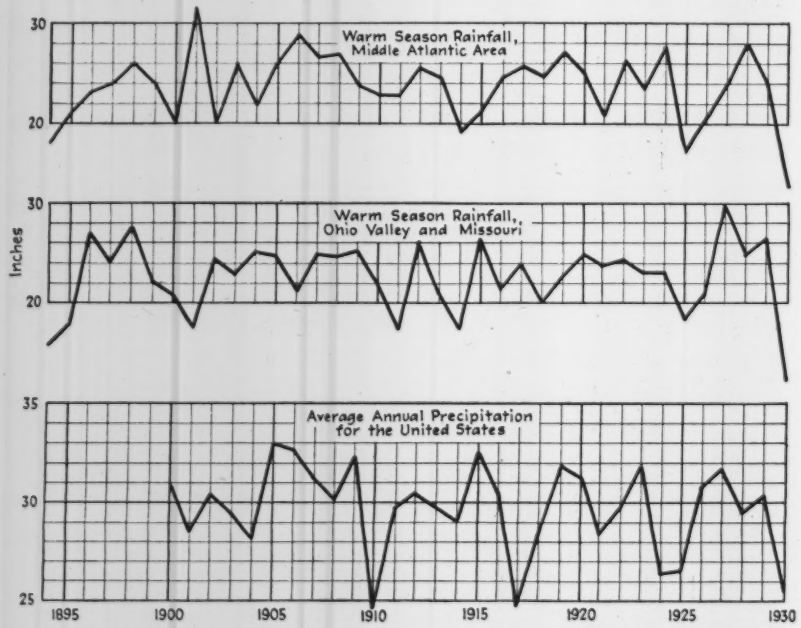


Fig. 2—Summer rainfall deficiency is a more prominent characteristic of 1930 than deficiency in the year's total.

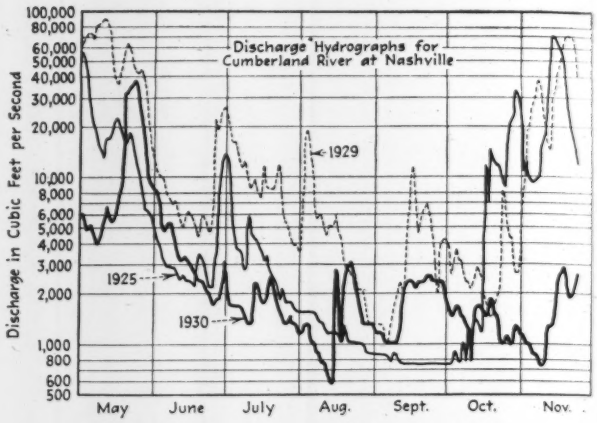


Fig. 3—Flow of some streams decreased beyond precedent, as shown by discharge curves of Cumberland River at Nashville for 1930 in comparison with 1929, a normal year, and the exceptionally low year 1925.—*Data from U. S. Geological Survey in cooperation with division of geology of Tennessee*

It is also noteworthy that appeals for relief have come in part from communities that long have been on the ragged edge, though including some of the richest soils in the country. They are typical famine areas, those in which the bounty of nature has led to lack of thrift, single-cropping and subjection to local tradesmen and bankers. Thus, the public has been aroused to a depressing situation that in essence has always existed but that had not previously reached the same proportions. Moreover, the recent policy of the federal government in going to the relief of sufferers from earthquake, fire flood or drought, has not tended to minimize claims for aid.

So also in some of the outlying areas of the relief region, as for example Montana, Mexico and Texas, the drought and excessive temperature of 1930 were contributing or intensifying factors, but the underlying causes are of another kind. In Montana most of the people now suffering should never have been encouraged or permitted to stake their fortunes on the speculative dry-farming risks of the semi-arid regions. The blame here rests on vagaries of human nature rather than on those of climate.

As was to be expected, the shortage of rainfall had a far-reaching effect on water sources. The lowering of groundwater, as indicated by wells going dry, has already been mentioned. The effect on streams is represented by the diagram of Fig. 3. The Cumberland River, at Nashville, dropped to the level of the exceptionally low year 1925.

Water supplies were affected extensively and seriously throughout the Eastern half of the country. Many municipal supplies were pinched for water in August and September. Other towns found their main supply lines inadequate to meet the combination of low supply and heavy draft. In consequence, there was much activity in developing hurried plans for

TABLE I—AVERAGE RAINFALL BY STATES FOR 1930

(From "Weekly Weather and Crop Bulletin," U.S. Weather Bureau, Jan. 20, 1931)

Per Cent of Normal and Total Inches of Rainfall

States	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total %	Total Inches
Ala.	88	43	98	34	96	46	73	77	196	104	233	59	88	46.2
Ariz.	174	41	181	65	269	118	144	103	80	40	247	18	116	15.2
Ark.	223	117	47	29	200	22	19	70	121	165	114	62	96	46.6
Calif.	97	65	85	92	134	10	22	80	100	31	97	11	72	18.4
Colo.	155	68	67	57	134	49	140	160	72	84	157	27	101	17.3
Conn.	69	74	78	52	109	124	61	61	33	63	145	76	77	35.0
Del.	102	62	52	57	89	68	66	36	86	49	75	55	65	28.0
Fla.	126	99	241	131	105	159	62	62	126	65	156	146	114	60.2
Ga.	118	32	121	91	65	87	100	36	173	61	216	79	93	46.1
Idaho	71	120	84	114	131	66	54	181	114	117	71	31	93	16.3
Ill.	208	104	48	79	46	87	31	57	101	85	90	32	77	27.9
Ind.	209	98	47	73	45	68	52	63	116	57	64	37	76	29.7
Iowa	125	55	50	90	81	130	39	70	63	86	137	50	81	26.1
Kans.	148	27	20	109	115	98	60	92	104	184	199	42	100	26.8
Ky.	112	101	46	33	73	42	30	60	86	48	51	55	61	27.9
La.	166	78	78	29	132	13	61	89	180	140	171	74	96	52.9
Me.	82	63	160	50	130	86	106	91	64	82	90	57	89	35.6
Md.	79	69	60	76	59	85	33	26	40	26	48	82	56	23.4
Mass.	74	64	93	47	97	90	112	57	37	107	119	71	80	33.8
Mich.	118	104	75	71	96	109	47	27	69	71	65	46	74	22.6
Minn.	88	171	44	52	136	94	71	34	120	81	228	28	90	22.6
Miss.	107	69	71	23	208	13	52	74	156	116	178	70	89	47.3
Mo.	221	81	45	53	73	79	24	54	109	106	122	59	79	31.2
Mont.	57	82	103	121	59	58	68	90	114	143	97	29	80	12.4
Nebr.	140	54	38	150	145	85	45	147	77	171	242	30	109	25.6
Nev.	128	75	67	101	256	32	43	182	214	97	178	8	108	9.8
N. H.	92	60	130	51	137	110	113	85	46	92	93	48	88	33.6
N. J.	81	78	66	64	74	113	86	67	56	53	116	64	77	35.2
N. Mex.	117	37	98	58	99	76	132	86	68	183	143	51	98	14.6
N. Y.	107	63	117	70	103	117	76	63	84	48	77	62	82	32.2
N. C.	94	33	65	59	76	98	62	50	90	71	128	111	75	38.0
N. Dak.	54	241	11	91	103	88	40	64	62	181	150	35	83	14.9
Ohio	162	110	81	65	50	60	40	68	91	49	56	42	71	27.0
Okla.	173	97	27	80	136	93	38	59	65	126	110	121	94	30.7
Oreg.	68	104	55	97	123	61	11	43	96	75	60	39	73	22.7
Pa.	68	101	86	80	76	102	51	35	72	31	53	71	68	28.8
R. I.	77	89	72	38	83	80	90	61	32	114	101	77	76	32.8
S. C.	125	26	86	70	68	91	82	42	110	72	187	109	84	40.2
S. Dak.	88	101	50	100	90	77	34	118	76	158	177	28	87	18.1
Tenn.	105	94	89	37	134	33	54	65	106	93	91	69	80	39.0
Texas	99	82	84	60	141	66	41	59	67	241	116	89	95	29.6
Utah	134	84	77	69	129	74	121	214	162	91	114	19	116	15.1
Vt.	108	44	154	53	146	132	99	58	61	64	92	57	89	32.9
Va.	80	48	56	67	65	77	39	40	41	45	77	98	60	25.2
Wash.	46	129	79	91	105	92	11	24	80	93	53	42	72	27.4
W. Va.	49	85	82	55	56	64	42	54	48	32	51	80	59	25.4
Wis.	94	120	74	79	91	133	70	32	84	87	65	32	82	25.1
Wyo.	95	82	90	55	108	70	90	331	61	169	73	31	101	14.6

supplementary increased supplies. Such cities as Baltimore and New York, which have begun or are preparing to begin additional supply construction, found their reserve supplies decreasing in spite of having large hold-over capacity. Some municipal supplies go into 1931 with a serious accumulated deficiency.

The most serious water-supply shortages were those of farming regions, because of their general dependence on shallow wells. In some districts for weeks water had to be hauled many miles. This difficulty, fortunately, in many instances is easily remedied by carrying the wells deeper.

Water-power production decreased in 1930 by about 5 per cent, as compared with the preceding year. A part of this decrease may be attributed to reduced industrial activity and therefore demand for power, but as most of the plants in well-developed large systems are operated as base plants, and as the total power consumption in the country decreased by about 1 per cent, the larger part of the decrease in water-power production must be attributed to effects of the drought. This is confirmed by figures expressing the ratio of water to steam-electric power. From March to November this ratio dropped from 41 to 28 per cent. Growth and interconnection of power systems has been so well developed in most industrial regions as to insure continuity of operation regardless of water shortages.

In North Carolina, where the streams are well developed for power, five of the nine river basins had a cumulative rainfall deficiency exceeding anything on record.

Low stream stages interfered with river navigation. On the lower Mississippi River boats were constantly grounding, and barges were reduced in loading. By the end of August there were only a few places between Cairo and St. Louis where the water reached a depth of 7 ft. However, the 1930 experience made no material change in ideas concerning engineering or economic conditions. Major General T. Q. Ashburn, chairman of the Inland Waterways Corp., which operates the barge line on the Mississippi River, believes that all present difficulties will disappear with the completion of properly developed flood control.

The reduced streamflow caused great concern in late summer with respect to stream pollution from city and industrial sewage. However, typhoid fever showed no significant increase. Water authorities everywhere were alert in supervising the quality of their supplies and in increasing the chlorine dosage.

General Conclusions

In summary, 1930 was a notably low year in our water history and set a number of low records. The facts suggest the following conclusions:

1. Hydrologic data are too few and too slowly compiled, and groundwater data are almost absent. This emphasizes the need for countrywide research into the phenomena of the quantity, quality and movement of waters under ground and their effect on streamflow. Fuller development of the collection and coordination of streamflow data is also needed.

2. The factors of safety in many water-supply systems are too low to give adequate protection to public needs in abnormally low seasons.

3. In view of the agricultural losses, development of local emergency water supplies for supplementary irrigation presents opportunities of promise.

TABLE II—CONSECUTIVE RAINFALL DEFICIENCIES IN 1930

(Percentages of normal given for all states where two or more consecutive months were below normal.—J. B. Kincer, U. S. Weather Bureau.)

State	1929	1930											No. of Mos.	Accumulated Percentages	Water Shortage in Million Tons
	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.			
Md. and Del.	27	18	32	41	26	38	17	63	74	56	71	49	12	512	14,883
W. Va.	26	51	15	18	45	44	36	58	46	52	68	49	12	508	25,727
Va.	36	20	52	44	33	35	23	61	60	59	55	23	12	501	45,904
Ky.				54	67	27	58	70	40	14	52	49	9	431	42,868
Ohio				19	35	50	40	60	32	9	51	44	9	340	34,394
Mo.			19	55	47	27	21	76	46				7	291	55,209
Ind.			2	53	27	55	32	48	37				7	254	24,150
Ill.				52	21	54	13	69	43				6	252	36,085
Mont.						41	42	32	10				4	125	26,576
S. Dak.						10	23	66					3	99	16,271
Okla.							7	62	41	35			4	145	23,318
Tex.							34	59	41	33			4	167	92,337
N. Dak.							12	60	36	38			4	146	17,768
Ark.							78	81	30				3	189	29,680
Miss.							87	48	26				3	161	24,421
Tenn.							67	46	35				3	148	19,742
La.							87	39	11				3	137	25,253
Minn.							6	29	64				3	99	20,826
Kans.							2	40	8				3	50	11,295
Nebr.							15	55					2	70	14,009
Pa.								49	65	28	69	47	5	258	30,658
Mich.								53	73	31	29	35	5	221	26,005
Wis.								30	68	16	13	35	5	162	19,472
N. Y.								24	37	16	52	19	5	148	18,501
N. J.								14	33	44	47		4	138	3,200
Iowa								61	30	37	14		4	142	20,103
New Eng.									34	52	17		3	103	18,248

Present Status of MAJOR ENGINEERING PROJECTS

Hydro-Electric Power Developments

Hoover Dam—Bids will be opened March 4 by the U. S. Bureau of Reclamation for the construction of the 730-ft. Hoover Dam, to be built on the Colorado River at Black Canyon, near Las Vegas, Nev. Contracts have just been awarded by the bureau for the construction of a railroad and a highway from Boulder City to the dam site, a distance of about 10 miles. Construction of the Union Pacific branch line, 22.1 miles long, between the main line of the Union Pacific and Boulder City, including 66 bridges, 22 culverts and 5 miles of yard track, is complete except for the finishing of ballasting and track laying.

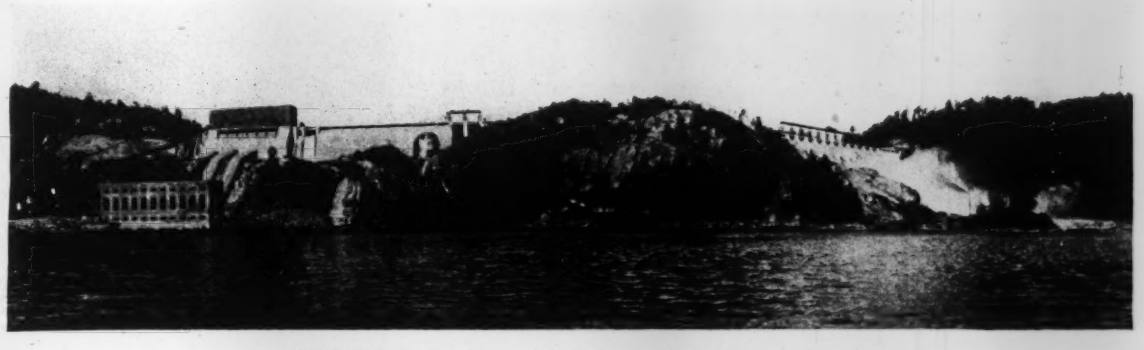
Osage Power Project—The initial installation of the Osage hydro-electric development being built near Bagnell, Mo., for the Union Electric Light & Power Co. is scheduled to be ready for operation by Oct. 1, 1931. Construction work was started on Aug. 6, 1929, and the first concrete was poured 8½ months later. Practically all concrete in the dam, except final closure notches, is in place. Road approaches are under construction for Highway No. 54, which will cross the dam. On Jan. 15 all six scroll cases for the waterwheels had been concreted and the electrical bay had been concreted for about one-half of its length. This structure will shortly be ready for the installation of the electrical apparatus. Most of the H-frames have been set for the 138 mile wood-pole transmission line between Osage and St. Louis. Wire stringing was started last month. Erection of steel towers for the 122-mile transmission line from Osage to Rivermines was scheduled to be started on Feb. 1. Construction of the dam involved the excavation of 875,000 cu.yd. of earth and gravel and the placing of 550,000 cu.yd. of concrete, 113,000 cu.yd. of which was placed in a single calendar month. The reservoir will be 129 miles long and will cover an area of about 61,000 acres. The initial installation will contain six 21,500-kw. generating units with provision for a future installation of two additional units, making an ultimate development of 172,000 kw.

Moving material into the rolled-fill Echo Dam

Hardy Dam—Between April 1 and Nov. 26 1,410,000 cu.yd. of fill was placed in the Hardy hydraulic-fill earth dam being built on the Muskegon River at Oxbow, Mich., completing this portion of the structure. Other quantities in the dam are 57,000 cu.yd. of reinforced concrete, 1,400 tons of steel sheetpiling, 1,460 tons reinforcing steel, 225 tons of structural steel and 396 tons of penstock steel. A 40,000-sec.-ft. emergency spillway is now under construction at the extreme west end of the dam. The maximum height of the dam is 120 ft. Three Francis-type vertical turbines developing 14,800 hp. each will operate under a head of 99 ft. These three turbines are in place and one of the three generators has been set. Generating units will be complete by March 1 and the entire project will be finished by early summer.

Safe Harbor, Pa.—Preliminary construction work for the Safe Harbor hydro-electric development on the Susquehanna River, such as camp buildings, shops, roads and bridges, classification and storage yards, and opening of quarries, was carried out during the winter of 1929-30. Cofferdam construction in the river proper was started on April 1, 1930. Favorable weather and extraordinarily low river flows have expedited construction progress. The so-called island bulkhead or non-overflow section of dam in the middle of the river and the east spillway section, constituting together nearly one-half of the total length of the dam; the concrete and steel skimmer wall and rockfill ramp or breakwater which inclose the forebay; the excavation for the power house and tailrace, and the widening of the roadbed of the Columbia & Port Deposit Railroad at existing grade are practically completed. The power house intake foundations and piers are nearly completed and construction of the draft tubes for the initial units is well under way. Over 180,000 cu.yd. of concrete has been poured out of an ultimate total of about 450,000. Construction of the second cofferdam, which will inclose one-half of the west spillway, has been started. Elevation of the tracks of the Columbia & Port Deposit Railroad is progressing rapidly. Intake structures are being built and the tailrace has been excavated for an ultimate installation of twelve main generating units. The power house substructure and superstructure are being built for seven units, but the initial project includes generating equipment for only six units, of which it is expected that four will go into operation in the spring of 1932. The main turbines are rated at 42,500 hp. at 55 ft. gross head, making the turbine capacity of the initial project 255,000 hp.

Carpenter Project, Arkansas—The Carpenter hydro-electric development, now under construction for the Arkansas Power & Light Co., is located on the Ouachita River about 4 miles south of the city of Hot Springs, Ark., and at the upstream end of Lake Catherine, the reservoir of the company's Remmel hydro-electric development. The Carpenter project consists of a concrete gravity dam having an over-all length of about 1,164 ft., made up of the following: a spillway section 453 ft. long containing ten 26x34-ft. tainter gates and one 15x14-ft. trash gate; a power house section 278 ft. long, and two abutment sections, one on each end, having a total length of 433 ft. The maximum height of the



High Falls hydro-electric development, Lievre River, Quebec

Three 30,000-hp. units are now in operation in this plant of the Maclaren-Quebec Power Co. at Buckingham, Quebec, about 20 miles east of Ottawa. The project also includes a storage dam impounding 25,000,000 cu.ft. of water, and plans are completed for a second development of 120,000 hp. a few miles farther down the river, the site of the company's new 250-ton newsprint mill.

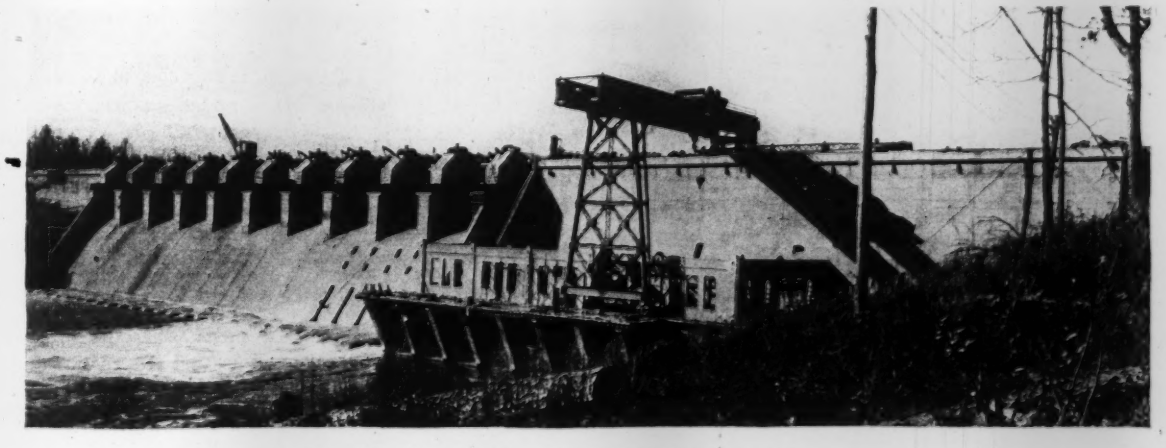
dam will be about 115 ft. The power house will be of the outdoor crane type. The present installation will include two 28,000-kw. generators operating under a rated head of 89 ft. Provision has also been made for the installation of a possible future third unit. The reservoir formed by the dam will have a total area of about 8,000 acres and an effective storage of about 100,000 acre-ft. within the limits of the drawdown. Sluice gates of the dam were closed Dec. 17, 1930. The power house superstructure is in course of erection and the installation of the major and auxiliary equipment is going forward.

Wyman Dam—Earthwork on the Wyman dam, built by the New England Public Service Co. at Bingham, Me., is complete. One generating unit is now operating under a head of 115 ft. and another unit is about ready for operation. The maximum head under which the units will operate is 155 ft. Work on the power house is nearing completion. The 110-kv. line from Bingham to Bucksport and to the station near Lewiston has been completed. The concrete core wall of the earth dam rests on deep pneumatic caissons sunk through the glacial drift of the valley floor.

Mokelumne Project—With the 328-ft. Salt Springs rock-fill dam scheduled for completion in June, the $40,000,000 Mokelumne River power project of the Pacific Gas & Electric Co., begun in 1926, is about ready for the start of power production. More than 2,500,000 cu.yd. of rock has been placed in the dam, almost 85 per cent of the total yardage, and the concrete facing is half completed. The Salt Springs power house, located at the base of the dam, is ready for the installation of machinery. Work is well advanced on the 19 miles of concrete flume 7 ft. deep and 14 ft. wide to convey water from the dam to the new Tiger Creek power house, where power production under a 1,220-ft. head is scheduled to start by June. Subsequently the old Electra plant will be rebuilt to use the increased water supply. Total power output from the three plants on this project will be 229,000 hp.

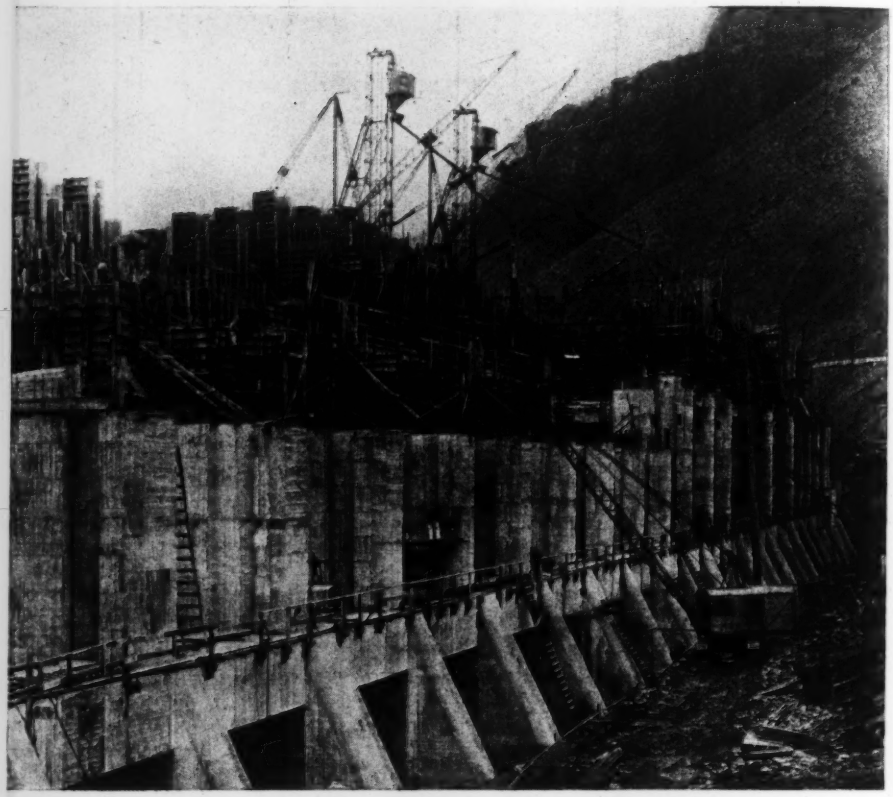
Ariel Dam—Concrete placing is about 70 per cent completed on the 313-ft. Ariel dam being built on the Lewis River near Portland, Ore., for the Inland Light & Power Co. The central arch section, which extends 125 ft. below streambed to the lowest point in the foundation, is being constructed in 30-ft. lengths separated by 2-ft. spaces to accelerate the dissipation of heat. Filling of the spaces is planned for the coming summer to impound the flood runoff in the 232,000 acre-ft. reservoir. One arch abutment consists of a gravity section thrust block which supports the spillway gates of 120,000 sec.-ft. capacity, or double the volume of record flood. Flood discharge from the spillway will be carried by a concrete apron to the streambed below the powerhouse. The dam, which has a crest length of 1,200 ft., will produce a head of about 200 ft. for the present power installation of one 45,000-kw. generator; the power house is located at the base of the structure. The present project, planned for completion in July, 1931, is the initial development on the Lewis River, with ultimate plans for several storage dams and a power development of four billion kilowatt-hours per year.

Rock Island Dam—With 2,600 men at work, the dam and power house structure in the east channel of the



Carpenter dam and power house, Ouachita River, Arkansas

Columbia River near Wenatchee, Wash., is well ahead of schedule and is being rushed during the winter low-flow period. In the twelve-month period since the beginning of actual construction work on this hydro-electric project for the Puget Sound Light & Power Co., the river has been diverted from one side of the island, the site unwatered, foundation excavated and more than 100,000 cu.yd. of concrete placed to bring the structure above flood elevation. This unusually rapid construction program, which included the building of two cofferdams, each 750 ft. long, in 85 days with only a one-day margin before the spring flood of 1930, has resulted in the saving of one year's time in completion of the project. With construction work in the east channel above the danger of flood, the cofferdams will be dismantled and partly re-used for the diversion works in the west channel. This cofferdam construction will be done during the winter low-flow months and, following the spring floods, water will be diverted through openings in the present structure and construction will be concentrated on the second half of the project. The width of the east channel is approximately 850 ft. and the dam has a maximum height of 113 ft. The present power installation will consist of four 21,000-hp. units with the ultimate addition of six more, utilizing a head varying from 20 to 48 ft. This project marks the first major power development on the Columbia River.



Power house construction on the Rock Island project

Bridge River Development—The 13,200-ft. tunnel, 14 ft. in diameter, for the Bridge River power project in British Columbia was completed this year and lining work is well under way. It will divert water from the river to a power plant on Seton Lake for the development of a head of 1,300 ft. An initial installation of 56,000 hp. is expected to go into service in 1932. Ultimately the entire development will have a capacity of about 600,000 hp.

Chats Falls on the Ottawa—Work on the 224,000-hp. development on the interprovincial boundary at Chats Falls, on the Ottawa River above Ottawa, is progressing rapidly. The dam is well along toward completion and the placing of concrete in the power house has been started and will be continued throughout the winter. The first units of the power house are expected to be put into service late this year and the remainder in 1932.

Queenston Plant, Niagara River—During the year the Ontario Hydro Electric Power Commission put the tenth unit (58,000 hp.) into service in its Queenston plant on the Niagara River. This brings the installed capacity of the plant up to 560,000 hp., the largest single generating plant in Canada.

Beauharnois Power Plant—Construction of a 500,000-hp. power plant in the Soulanges section of the St. Lawrence River near Beauharnois, Que., was begun in August, 1929. Outside of the power house and a large quantity of rock to be removed from the tailrace, the work is chiefly an earth-moving proposition on a large scale, in constructing a 15-mile intake canal 3,380 ft. wide between dikes. Control works at the head of Coteau Rapids also are included in the project. Work on the canal and power house is being pushed rapidly. In view of the large quantity of earth and rock to be moved (30,000,000 cu.yd. for the initial 200,000-hp. development) unusually large excavating equipment is being used, including four 10-yd. tower excavators, an 8-yd. electric shovel and a 30-in. hydraulic dredge. Up to the end of the year 10,600,000 cu.yd. of material had been moved. It is expected that the initial 200,000-hp. installation will go into service late in 1932.

Chute-à-Caron Project, Saguenay River—Work on the Chute-à-Caron power project near Arvida, Que., is well along toward completion. It is expected that the first units in the power house will be put into service early this year. When completed the plant will contain four 65,000-hp. units. The Chute-à-Caron project is the initial step in the development of the remaining usable head on the Saguenay River in a plant having an installed capacity of about 1,000,000 hp.

Rapide Blanc, St. Maurice River—Construction of a 240,000-hp. hydro-electric plant at Rapide Blanc on the St. Maurice River in Quebec was begun during the year. The initial installation of 160,000 hp. is expected to be ready for service late in 1932.

Abitibi Canyon Project—Late in the year contracts were let for the start of a 275,000 hp. hydro-electric power plant on the Abitibi River canyon in northern Ontario. Work this winter will be confined chiefly to construction of the river bypass and preliminary work for the dam.

Madden Dam, Panama Canal Zone—Surveys for the construction of a dam, reservoir and hydro-electric power plant at Alhajuela, on the Chargren River in Panama, have been carried on during the past year, and $1,150,000 has been expended on investigations and upon the construction of a road to the dam site. It is reported that a gravity type dam has been determined upon by the board of consultants and that bids will be called for about July. The dam is to provide additional water for lockages in the canal, for power and for municipal use.

Water-Supply Structures

Hetch Hetchy Project—Tunnel driving is about 60 per cent completed on the 28.6 miles of Coast Range bore for the Hetch Hetchy water-supply system of San Francisco. After a delay of almost six months caused by serious conditions of natural gas, work is under way again and the rate of progress is nearly up to speed maintained before the shutdown in spite of the more rigid safety precautions. Driving of the remaining distance, lining the tunnel with concrete and building the 45-mile pipe line across the San Joaquin Valley, to connect with the completed mountain division, are programmed for completion in 1933. Continued deficiency in local precipitation since the city took over the local system of the Spring Valley Water Co. in March, 1930, has made advisable the construction of an emergency connection to the system of the East Bay Municipal Utility District. This pipe line about 14 miles long will permit the securing of an emergency supply if necessary during the period before the Hetch Hetchy supply becomes available.

Colorado River Aqueduct—The Parker route for conveying Colorado River water to the southern California metropolitan area has been selected and subsequently confirmed by the consulting board. The proposed aqueduct for the Metropolitan Water District is 265 miles long and the estimated cost is about $200,000,000 for a 1,500 sec.-ft. capacity. A 1,523-ft. pumping lift is required and tunnels aggregating 93.7 miles. Selection of the Parker route was based on lowest cost, considering all cost elements, safer geological formations and lack of interstate complications. The next step toward securing this water supply for the rapidly growing district is an election to approve a bond issue for the project.

Eagle Mountain and Bridgeport Dams—Work is well under way on the Eagle Mountain and Bridgeport earthfill dams being built on the West Fork of the Trinity River as a water supply and flood-control development for the city of Fort Worth, Tex., and Tarrant County. Of the construction cost estimate for the building of Eagle Mountain dam, $2,649,000, to date contract estimates amounting to $825,093 have been paid. This dam will contain 2,360,000 cu.yd. of fill, and completion is expected by Dec. 31, 1932. The Bridgeport dam will contain 1,390,000 cu.yd. of fill and will be completed by the end of this year. Contract estimates totaling $708,652 have been paid to date. The estimated construction cost of this project is $1,549,000.

Chicago Water-works Improvements—Nearly half of the excavation for the new 16-ft. Chicago Ave. intake tunnel has been completed. Of the total length of 43,000 ft., 19,600 has been completely excavated, and the concrete lining has been placed in 9,260 ft. The substructure of the new intake crib is completed, and work will soon be started on the sinking of the intake shaft. Although voters approved the filtration program at the November election, no money has yet been appropriated for permanent plants, hence the program has not yet reached the construction stage.

Louisville Filter Renovation—The original filters of the Louisville Water Co., designed by the late Charles Hermany and completed in 1909, have been removed and are now being replaced with a concrete structure. Although the Hermany filters had continued to function satisfactorily, the steel plates of which they were largely constructed had become so badly corroded that failure of the installation was feared. It is expected that the new filters will be in operation by April 1, in accordance with the terms of the contract.

Prettyboy Dam—In order to increase the dependability of the Baltimore water supply, a 20-billion gallon reservoir is being formed on the Gunpowder River some miles above the present Loch Raven dam and reservoir. The new dam is to be of the gravity overflow type, 133 ft. from streambed to crest, with spillway 448 ft. long. The over-all length of the dam is to be 692 ft. An arch bridge composed of eight 50-ft. spans to be built above the spillway will carry a 20-ft. roadway and two 4-ft. sidewalks. The contract for its construction was awarded Oct. 20. Construction was started on Nov. 17, 1930. Fairly good progress has been made on the excavation for the foundation, spillway steps and abutment area for the approaches. The material encountered is the Wissahickon schist, with an overburden of earth varying from 4 to 50 ft. in thickness. Clearing and grubbing of the reservoir site has been in progress since June 27, and is now about 30 per cent completed. Surveys have been completed for the replacement of roads and bridges which will be flooded. Plans are now being prepared and the construction of new roads and bridges will be started in the early spring. Contract price for the dam and appurtenances is $996,700.

Wachusett-Coldbrook Tunnel—The 14.2-mile tunnel being driven to divert the waters of the Ware River into Boston's water-supply system will be ready for use March 1, 1931. Excavation was completed last June and the concrete in side walls and arch has been placed except for a distance of 300 ft. About 2 miles of invert remains to be built to complete the job.

Cobble Mountain Development—Construction work on the Cobble Mountain dam, being built by the city of Springfield, Mass., for its water supply, originally scheduled for completion Oct. 1, 1930, was delayed last year by default of the contractor. The contract was relet in August, calling for completion by July 1, 1931. The 250-ft. earthfill dam, the highest hydraulic-fill structure in the world, will contain nearly 2,000,000 cu.yd. of fill. At present the hydraulic fill is 104 ft. above foundation, or

Diablo Dam, the hydro-electric project of Seattle, Wash.

146 ft. below finished grade. The rock toes, containing approximately 300,000 cu.yd., are about finished. Cutoff walls and cutoff trenches have been practically completed. Excavation of the spillway, reaching a maximum depth of 50 ft. in rock, is nearly done and a concrete plant is ready to complete the weir and spillway bridge as soon as weather permits. Clearing is practically finished in the reservoir area. The outlet tunnel, 7,100 ft. long, 10 ft. in diameter and costing $700,000, was completed last year ahead of schedule.

New York City Water Tunnel—The driving of the 20-mile water tunnel extending from Hill View reservoir in Yonkers to South Brooklyn, crossing the boroughs of the Bronx, Queens and Brooklyn, is 60 per cent complete. The tunnel is being driven from nineteen shafts and, for the most part, is 500 ft. below sea level. No concrete lining has yet been placed. The tunnel section is circular, 17 ft. in diameter inside of an 18-in. concrete lining, except at the extreme north and south ends, where the inside diameter is 15 ft. It is being built by the board of water supply of the city of New York to give an additional supply to the boroughs of the Bronx, Queens and Brooklyn, which are now served from one main aqueduct traversing the western part of the Bronx and Manhattan Island.

Albany Water Supply—Long dependent upon the Hudson River for its water, the city of Albany, N. Y., will soon place in service an entirely new supply system derived from the hills to the south and west of the city. Major structures included in the project include the Alcove dam, completed in July, 1929; a smaller diversion dam 800 ft. long and 25 ft. high; a diversion tunnel 5x6 ft. in section and 2,800 ft. long; 105,000 ft. of 48-in. cast-iron supply main leading to the city; a 32-m.g.d. filter plant, midway along the supply line; a new 100-m.g. concrete lined distribution reservoir in the northern part of the city; and improvements in the distribution system. The work is practically completed and it is expected that the new supply will go into service this spring. Total cost, including filter plant, is approximately $9,000,000.

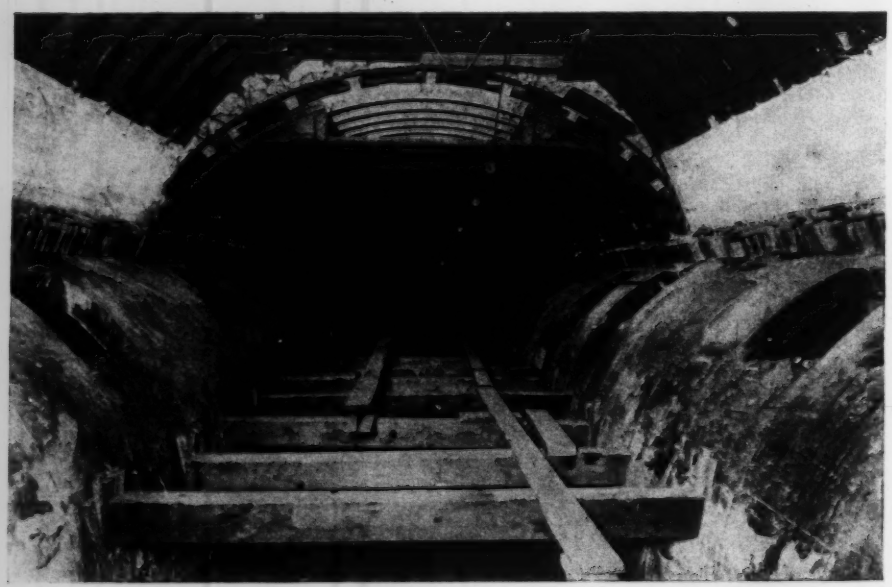
Detroit Water-Works—Good progress is being made on the new water-supply project for Detroit; partial operation is expected by July. The new intake substructure is completed and the necessary dredging and riprap on the lagoon banks will be finished this spring. Bids will be received soon for the intake superstructure. The river tunnel from intake to shore shaft has been holed through and 2,400 ft. of concrete lining placed. The remaining 1,300 ft. of lining will probably be finished shortly. The land tunnel from Water Works Park to the Springwells station, more than 11 miles in length, is complete except for 600 ft. in Water Works Park. At the new Springwells station the substructures of the pumping stations are sufficiently completed to allow the erection of steelwork, and masonry work will start in a few weeks. Substructures for the boiler, turbine and switch houses are approaching completion. Erection of two low-lift pumps will begin March 1. The filtration plant substructures and superstructures are practically completed. The interior of the superstructure will be completed this spring, including the decorative work, plumbing, heating and electrical contract. Wash-water equipment is now being installed and filter underdrains are purchased. Filter sand will soon be purchased ready for installation in the spring.

Sewage-Treatment Works

Columbus Sewerage Program—In carrying out a program of correcting the pollution of the Scioto and Olentangy rivers, Columbus, Ohio, is engaged in a project of constructing intercepting sewers along those streams from the existing pumping station to the city boundary, a cross-town tunnel to connect the lower end of the Alum Creek interceptor to the new sewers, and tanks at the several streams to receive stormwater overflow to give partial treatment by sedimentation. A sewage-treatment plant is to be constructed to allow discharge of the sewage below the city without nuisance. More than 12,000 ft. of the intercepting system has been completed to date, most of which has been rectangular reinforced-concrete sewer, 10 ft. 6 in. by 12 ft. Five miles of sewer remains to be placed under contract to complete the project. The remaining sections will vary from 9-ft. diameter to 3-ft. diameter conduit. The sewage-treatment plant and stormwater overflow tanks are now in process of design.

Sanitary District of Chicago—Construction activities of the Sanitary District of Chicago were actively resumed during 1930. Of the $27,000,000 of bonds authorized by the Illinois legislature in 1929, approximately $9,455,000 yet remain to be sold. Efforts failed to have the special session of the legislature in 1930 consider the emergency of granting authority to the district to issue bonds without referendum at the rate of $20,000,000 per year for the next two years in order to carry out the sewage-treatment construction program. It is now planned to submit $36,000,000 of these bonds to public referendum at an election to be held in February, 1931. Since the decree of the U. S. Supreme Court of April 21, 1930, approximately $5,30,000 worth of construction work has been done on sewage-treatment projects. Treatment is now being given to 32 per cent of the total sewage originating within the district boundaries.

At the West Side sewage-works, two of the three batteries of Imhoff tanks have been placed in operation. Some 27 acres of sludge drying beds have been constructed and a part used. A contract was let for 2 miles of additional intercepting sewer. A contract was also advertised for the third battery of Imhoff tanks. At present the two Imhoff-tank



Subway construction in New York City

Brooklyn Bridge Plaza station, at the east end of the Fulton St. tunnels under the East River. Station roof is of stamped steel liner plates held by steel arch ribs. Platform will be built between cast-iron railroad tubes and part of cast-iron lining removed.

St. Johns bridge over the Columbia River

batteries now operating are treating the sewage of all the area west of Kedzie Ave., including the Salt Creek area, comprising a population equivalent to 510,000 people. The West Side plant receives much of the sewage tributary to the Des Plaines River plant and also digests the waste sludge from the North Side treatment works.

The North Side sewage-works were in partial operation during 1930 until August, when with the completion of the North Branch pumping station, the entire area tributary was handled. The preliminary figures for the 1930 census indicate that the actual population was approximately 980,000 in 1930, an increase of 150,000 above the estimated population for which the plant was designed. Additional preliminary settling tanks and final settling tanks are now being planned.

Ward's Island Disposal Plant, New York City—In the near future bids will be received for the construction of aëration and settling tanks and a small section of sea wall, the first units of the large sewage-treatment works to be built for the city of New York on Ward's Island in the East River. This work is expected to cost between $6,000,000 and $7,000,000.

Bridge Construction

Hudson River Bridge—Spinning of the four 36-in. cables of the 3,500-ft. suspension span between 178th St., Manhattan, and Fort Lee, N. J., was completed Aug. 7, 1930. The entire operation of spinning, which involved 28,450 tons of wire, was accomplished in approximately ten months. Roadway steel in both main and side spans has been hung in place, and slab reinforcement is being placed in preparation for pouring concrete in the spring. The roadway is eight lanes wide, but only the two outside lanes on either side will be paved initially.

Work on the approaches is the main consideration at present. On the Manhattan end, the concrete arch barrel of a 196-ft. span over Riverside Drive behind the anchorage block is in place; another arch of 120-ft. span (also over Riverside Drive, but farther south) is under construction. The Riverside Drive connection, of which this latter arch forms a part, is just started. Excavation of the main ramp eastward of the bridge is 100 per cent complete; concreting work on the ramp is 43 per cent complete, including the arch over Riverside Drive. No steel has yet been placed. At the end of the main ramp section, tunnel construction is under way and at present excavation and decking at 178th St. between Fort Washington Ave. and Amsterdam Ave. are 60 per cent complete.

The Jersey approach, which consists of a deep open cut through the Palisades, is completed except for paving and miscellaneous work including toll booths, etc. Total contracts awarded to date on the bridge are $30,500,000. During the year the five contracts which were awarded for approach work totaled $4,250,000. The bridge should be open for traffic about Jan. 1, 1932.

Kill van Kull Bridge—The arch steel in the 1,652-ft. span bridge being constructed by the Port of New York Authority between Bayonne, N. J., and Port Richmond, Staten Island, was closed and swung on Oct. 4, 1930. By Feb. 1, 1931, the floor steel was all in place, including both approaches. The New Jersey approach was completed early in the year except for a few special spans, but the Staten Island approach work had to be postponed until the main arch was swung, since much of the approach steel had been used in the falsework. Placing the concrete pavement over the entire length of the bridge will be done in the spring. Contracts now under way include the construction of the Port Richmond, Staten Island, plaza and paving and other miscellaneous work near the beginning of the Bayonne approach. Present indications are that the bridge will be opened to traffic on Jan. 1, 1932.

Waldo-Hancock Bridge—This high-level suspension bridge over the Penobscot River will provide a direct connection between the southwestern part of Maine and the eastern section and the maritime provinces of Canada, eliminating a slow ferry or a 40-mile detour to Bangor. It consists of a main span 800 ft. between towers, suspended side spans of 350 ft. each, and 540 ft. of continuous deck plate girder approach viaduct. Substructure work was started Aug. 2 and is completed with the exception of the west river pier, which will be finished in March. Anchorage steel has been erected, and tower erection will start about March 1. The contract calls for the completion of the cables and suspenders by May 15 and for final completion of all work by Sept. 1, 1931. The structure will be operated as a state-owned toll bridge.

Allegheny County Bridges—Three major bridges are now under construction by Allegheny County, Pennsylvania. The Westinghouse Bridge is a part of a joint project between the county and the Pennsylvania department of highways for the relocation of 5.4 miles of the Lincoln Highway just east of Pittsburgh. This relocation will eliminate a long grade with a maximum inclination of 9 per cent and will avoid congested traffic in the narrow and tortuous streets of Turtle Creek and East Pittsburgh boroughs, the cost being shared equally by the county and the commonwealth. The county has designed and is supervising the construction of the bridge, estimated to cost about $1,750,000. It is 1,524 ft. long, with a 42-ft. roadway and two sidewalks, and reaches a maximum height of 216 ft. above the valley of Turtle Creek. The design calls for a main open-spandrel two-ribbed concrete arch of 460-ft. span, center to center of piers, flanked by two spans on each end of 196.33, 255, 255 and 277.5 ft. respectively. The roadway grade is 4 per cent descending to the westward. Construction was begun in May, 1930, and is about one-third complete. Abutments are finished, except coping, and the piers are constructed to the arch spring lines. Erection of the centering will be started shortly and it is expected that the bridge will be ready for service about the end of the present year.

Erection of the superstructure of the McKees Rocks bridge over the Ohio River at Pittsburgh is about completed and the structure is scheduled for opening late this summer. This project extends from Island Ave. in the borough of McKees Rocks to California Ave. in the city of Pittsburgh, a distance of 7,300 ft., and intersects the $4,000,000 Ohio River Boulevard, another county project. The total cost of the McKees Rocks bridge will be nearly $6,000,000. The main span over the Ohio River is a spandrel-braced two-hinged steel arch, 800 ft. center to center of piers, flanked by two deck arch spans of 340 and 358 ft. Approach structures are made up of a filled retaining wall 1,145 ft. long with a maximum width of 103 ft., consisting of a high level for through traffic with four ramps, parallel to the bridge, for access to the business and residence area below; two 300-ft. crescent tied steel arch spans, nine deck-truss spans, two deck-arch spans, two deck-plate girder spans, an approach highway and a traffic circle at the intersection of Ohio River Boulevard. The two main river piers are founded on bedrock, 45 ft. below water, and have a total height above rock of 207 ft.

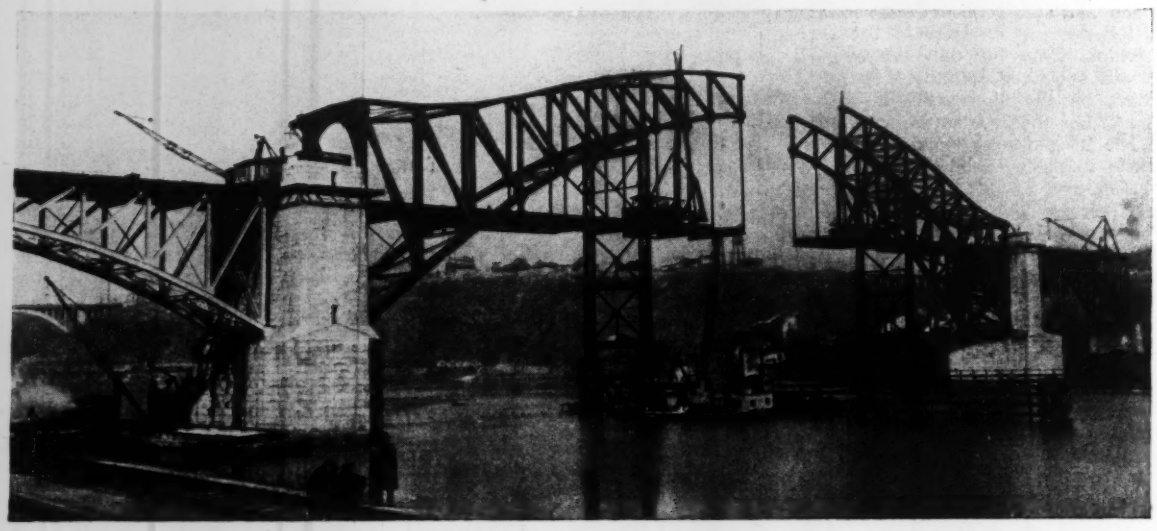
The West End bridge will cross the Ohio River just below the junction of the Allegheny and Monongahela rivers. All the masonry has been completed, except that for the complicated south approach, and erection of the superstructure has just been started. This bridge will provide a connection between the recently constructed Saw Mill Run Boulevard and the Ohio River Boulevard, both county projects, and will have a 40-ft. roadway and two sidewalks. The main span of 780 ft. center to center of piers will be a tied steel arch with floor system supported from the arch trusses by wire rope suspenders. This main span will be flanked by three half-through truss spans of 157 ft. 3 in., 140 ft. 9 in., and 145 ft. 3 in. at the southerly end and four similar spans at the northerly end of 178 ft. 3 in., 157 ft. 3 in., 157 ft. 3 in. and 175 ft. 3 in. It is expected that this bridge will be ready for use early in 1932.

Arlington Memorial Bridge—The Arlington Memorial Bridge, spanning the Potomac River at Washington, is complete except for roadway paving. The double-leaf bascule span is now finished and awaiting government acceptance. Contracts for the paving work will not be let until some time next spring. Although the bridge proper is 99 per cent finished, the entire project is only two-thirds completed. As originally planned, this included the approach on the District of Columbia end, extending all the way from the Capitol, and the extension of the roadway on the Virginia side up to the Arlington cemetery. The paving of the approaches on the Virginia side will be undertaken at the same time that the surface of the bridge is paved. It is expected that this paving work will be done and the bridge informally opened by next fall. The paving on the direct approach to the bridge from the Capitol will be done later, as will the remaining decorative and ornamental work on the project. The project is up to schedule, one-half of the ten-year specified time allotted expiring last June. Of the $15,000,000 authorized for the project, $10,000,000 has already been spent.

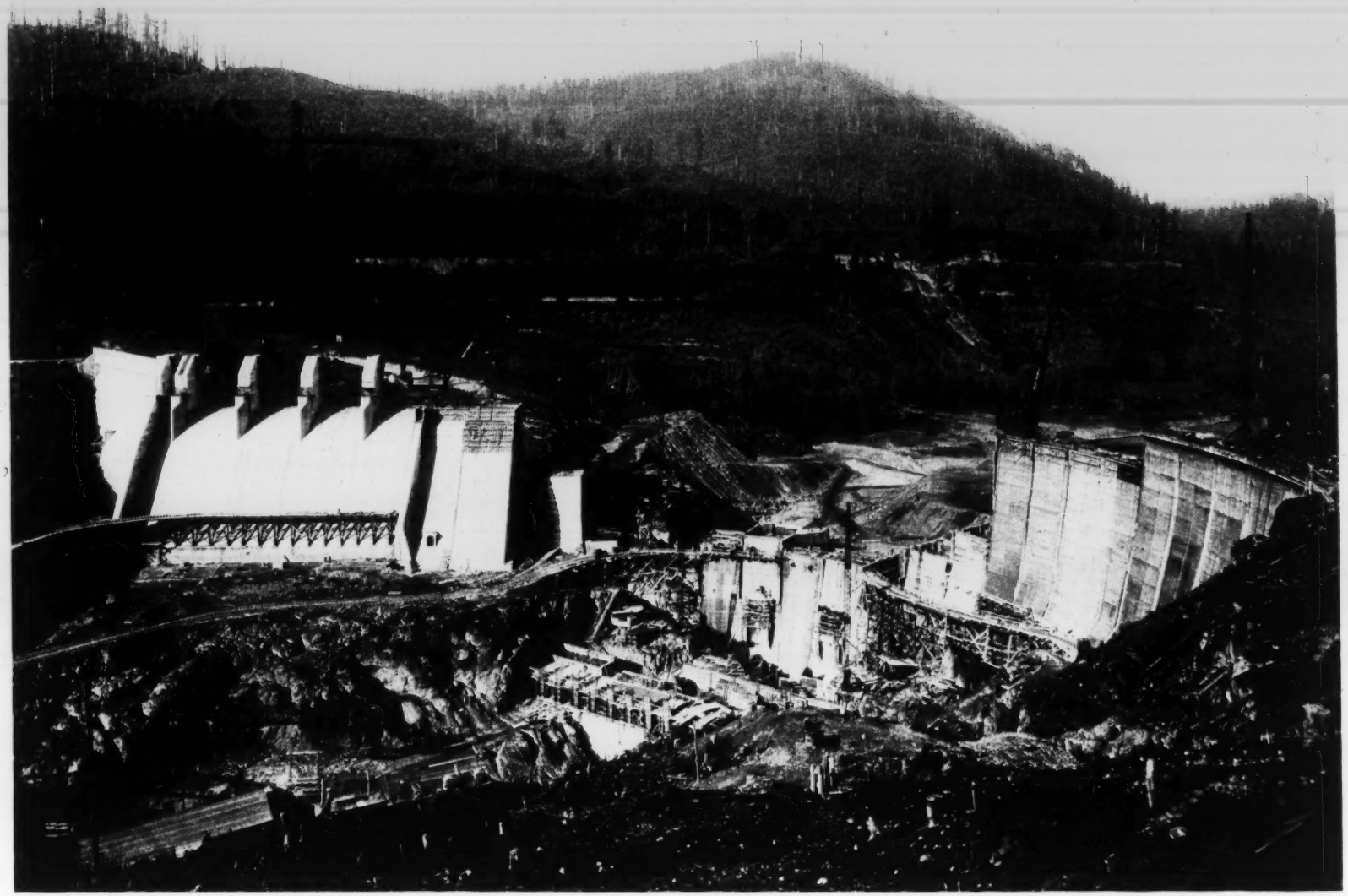
St. Johns Bridge—Stringing of the rope-strand cables for the St. Johns suspension bridge at Portland, Ore., was finished on Nov. 25, 1930, and the erection of cable bands and suspenders was completed on Jan. 2, 1931. The project is approximately 75 per cent completed. This structure, with a record-breaking span of 1,207 ft. for ropestrand type of cables, and an underclearance of 203 ft. over a 440-ft. channel, will provide another traffic connection between sections of the city and will be the eighth highway bridge across the Willamette River at Portland. Use of the rope-strand cables was the result of competitive bidding which indicated a $43,000 saving over the parallel strand design. The 91 cables are 1½ in. in diameter and were prestressed, cut to length and socketed before being shipped to the job. Stringing of the 1,200 tons of cable required a period of six weeks. The erection of the suspended span stiffening trusses and floor system and the decking of the entire structure, including approaches, with a concrete slab, will complete the work. Present plans call for completion by May 1, 1931.

San Francisco Bay Bridges—Progress toward bridging the water barriers north and east of San Francisco was marked in 1930. A bond issue of $35,000,000 was voted by a three-to-one majority by the district organized to build the Golden Gate bridge. Present plans for the structure call for a 4,200-ft. suspension span, a total overall length of approximately 6,000 ft. and a clearance at center of span of 215 ft. It is expected that bids will be called early in the spring.

Progress on preliminaries for the San Francisco-Oakland span included the establishment of the site by the Hoover-Young commission and suggestions for the construction. Four 1,700-ft. cantilever spans form the main portion of the bridge on the San Francisco side, and one long span, if permitted by foundation conditions, followed by trestle and earthfill will complete the structure on the Oakland side. A double-deck structure with rapid-transit lines on the lower deck is under consideration. Both structures would be publicly owned toll bridges, secured by the resulting revenues.



McKees Rocks bridge over the Ohio River near Pittsburgh



ARIEL DAM, LEWIS RIVER, WASH.

Engineering News-Record, February 5, 1931

The $12,000,000 Martinez-Benicia bridge of the Southern Pacific Railway over Suisun Bay, California

Reclamation, Flood Control and Navigation

Owyhee Dam—With the placing of 29,000 cu.yd. of concrete in the Owyhee dam during December, this 530-ft. arched-gravity structure being built for the U. S. Bureau of Reclamation in eastern Oregon is 50 per cent completed. During the past summer 38,000 cu.yd. of material was excavated from the fault zone in streambed and this crevice, which was 190 ft. deep, was refilled with concrete. In addition, almost 200,000 cu.yd. of rock and loose material has been excavated in preparing the foundation. In September major concreting operations were started, using an 8-cu.yd. bucket operating from an overhead cableway spanning the canyon. The two 4-cu.yd. mixers handle 1,000 cu.yd. of concrete per shift and placing is carried on either two or three shifts per day. Aggregate is brought to the site by train a distance of 25 miles and screened into five grades, including cobbles up to an 8-in. maximum size. The resulting concrete has an average strength of about 3,500 lb. at 28 days; considerations of impermeability and durability warrant the maintaining of a grade of concrete with this high strength. The dam will contain 540,000 cu.yd. of concrete, and the present schedule calls for completion of the structure by March, 1933.

San Gabriel Flood Control—Following abandonment of the proposed 500-ft. dam at the Forks site, the Los Angeles County Flood Control District is investigating three other possible dam sites on the San Gabriel River and its branches for flood control and conservation. Geological studies of these sites are being made and preliminary designs of flexible type dams are under way. The work is being financed by tax funds until the legality of using the remaining $21,000,000 of the original bond issue has been tested in the courts. General features of the new plan include: (1) storage aggregating 125,000 acre-ft. for regulation only, with release at a rate not exceeding the capacity of the spreading grounds, (2) acquisition and development of spreading grounds to distribute the regulated and desilted flow, and (3) construction of check dams on mountain areas subject to débris erosion. The release of sufficient tax funds has been made by the county and the test suit on the bond money will be started at once.

Flood Protection at Dallas, Tex.—Several miles of levee, 3,500,000 cu.yd. of earthwork for levee embankments and channels, four pumping plants and road approaches to the levees, together with minor works, represent the 1930 progress on the project of confining the Trinity River to a definite channel at Dallas, Tex., and reclaiming large areas of valley land formerly subject to flooding. The 1930 expenditures on these various works of the two levee districts representing the city and county were about $1,204,000, out of bond issues totaling $6,500,000. In addition to the district work, the city has carried on a considerable amount of revision of its sanitary and stormwater sewer systems, while Dallas County has built four concrete viaducts across the floodway and has a fifth under construction. Other works being carried out by the steam and electric railways and the public utility companies in connection with this project will amount to about $6,500,000, the total cost of the project being about $13,000,000. The greater part of the levees forming the floodway and of the low-water channel along the middle of the floodway have now been completed.

Middle Rio Grande Conservancy District—The $10,000,000 flood control, drainage and irrigation project of the Middle Rio Grande Conservancy District, in the central part of New Mexico, is 17 per cent complete. Construction started March 22, 1930, but did not get fully under way until July. About 94 miles of river levee and drainage ditch has been constructed, the excavation for the levee forming a parallel ditch. The completed system will have 400 miles of such levee and drainage ditch. Of 180 miles of interior drains, 20 miles has been constructed. No work has been started on the irrigation system, which will comprise 510 miles of main canals and laterals. Of 24,000,000 cu.yd. of excavation for the drainage and irrigation system and dam work, 5,000,000 cu.yd. was excavated during 1930. About 30 miles of permeable jetties have been placed to restrict the river to a defined channel. Nine engineering parties are in the field. Expenditures in 1930 were about $1,615,000, while those for 1931 will approximate $2,500,000. Levees, ditches and interior drains will be continued, while work will begin on the El Vado storage dam, diversion dams and irrigation canals. Of the four diversion dams, probably two will be completed during 1931. Progress is slightly ahead of schedule.

Welland Ship Canal—The new Welland ship canal was opened to downbound traffic in September. There remained to be done then only some minor work on the upbound flight of locks at Thorold, Ont. With the opening of navigation in the spring the entire project will be put into service. The new canal replaces one 14 ft. wide with 26 small locks. It has only eight locks and is almost straight in alignment. Its open channel has a bottom width of 200 ft. and depths of 25 ft. in earth and 27½ ft. in rock. The locks have a depth of 30 ft. over the sills, are 80 ft. wide and have a usable length of 820 ft. The total cost of the work will be about $120,000,000.

Illinois Waterway—Work is to be resumed on this 63-mile waterway connecting the Chicago drainage canal with the Illinois River as a link in a proposed Lake-and-Gulf water route. As the State of Illinois was unable to complete it within the $20,000,000 bond issue, while the Constitution did not permit of an additional bond issue, the U. S. war department has finally agreed to take over and complete the project, except that all bridges must be built by the state. Of ten bridges required, estimated to cost $2,500,000, five will be in the city of Joliet. It is expected that four, and possibly eight, of the bridges will be put under contract in 1931 by

the Illinois division of waterways. There are five locks and dams, and the first lock, at Lockport, is notable for its high lift of 41 ft. The works at Lockport, Marseilles and Starved Rock are completed, except for buildings and electric lighting equipment for lock operation at night. At Brandon Road 72 per cent, and at Dresden Island 35 per cent of the work is done. This waterway is to have a 200-ft. channel with 9-ft. of water and lock chambers 110x600 ft., having 14 ft. of water over the sills. With the appropriation by the federal government and the remainder of the state funds it is thought that the work under the U. S. engineers may be completed by the end of 1932 or during 1933.

Railways and Terminals

Great Northern-Western Pacific Connection — Construction work along the 200-mile connecting link between the Great Northern and Western Pacific railways in southern Oregon and northern California was begun in September, 1930, immediately following the issuance of a permit by the Interstate Commerce Commission. The Western Pacific was authorized to build north from Keddie, a distance of 112 miles, and connect with an extension of the Great Northern extending south from Klamath Falls, Ore., a distance of 88 miles. The work being done by the Western Pacific has major construction items involving twelve tunnels with an aggregate length of 6,500 ft., and fourteen steel viaducts and bridges totaling 5,345 ft. in length. This section of the line involves rather heavy grading for much of the distance in the vicinity of Mount Lassen National Park. The work to be done by the Great Northern is in more open country and will not require an extensive amount of excavation or grading work. Present plans call for completion of this connection early in 1932.

Compagnie Aerienne Franco-Canadienne

Sun Life Insurance Building, Montreal

St. Louis Terminals — During 1930 an agreement was reached by the city and the Terminal Railroad Association providing for the centering of cross-river rail traffic at the Municipal bridge, rather than the old Eads bridge. This will require the construction of five new approaches, mainly of the steel viaduct type, aggregating 2½ miles of line. Also, a new union station is to be built on a new site in East St. Louis, which will necessitate the elevation and relocation of about 5 miles of track. The total cost of the East St. Louis work, including the station, will be $3,500,000.

West Side Track Elevation, New York City — Plans for the removal of the New York Central tracks from the surface of the streets on the west side of Manhattan Island were approved in December, 1929. The project includes about 5 miles of double-track line, both elevated and depressed, largely upon a private right of way, double-deck yards and a large new terminal north of Canal St. The total cost is estimated at $138,700,000. Work this year has been confined principally to the demolition of buildings on the site of the Canal St. terminal and along the right-of-way where buildings have been vacated.

Canadian National Terminal, Montreal — Reconstruction of the terminal facilities of the Canadian National Railways at Montreal was begun in October. The work comprises the erection of a large new passenger terminal and office building on the site of the old Canadian Northern tunnel station in the heart of the city, reconstruction of the old Bonaventure passenger station as a freight terminal, and the construction of connecting railway lines to integrate the disconnected terminals of the railways which now are part of the national system. An elevated approach to the new terminal and a large amount of grade separation work are included in the project. The cost is placed at $50,000,000 and the work is expected to take five years.

Cleveland Union Terminal Electrification—Electrification of about 20 miles of track through Cleveland as part of the Union Station project was put into service last summer, when the new terminal was put into service. A total of 60 miles of track has been electrified.

Cincinnati Union Station — With $4,000,000 expended in 1930 and expenditures of $6,000,000 estimated for 1931, marked progress is being made by the Cincinnati Union Terminal Co. on its comprehensive terminal project. Apart from a passenger station with its various accessories and complicated connections with the numerous railroads, the project includes the construction of freight yards and freight stations to replace facilities displaced in clearing the 300-acre terminal site. Work was begun in August, 1929, and by Dec. 31, 1930, the entire site had been cleared of the complication of railway yards and industries. This work has included 3,540,000 cu.yd. of grading, steel railway viaducts, four bridges over streets, track relocation, 42 miles of new track and the construction of freight yards, two team yards and four freight stations for different railroads whose facilities formerly occupied the terminal site. Construction of the Western Hills viaduct for a highway across the terminal property and the Mill Creek valley was begun in November, 1930, and is to be completed by June, 1932, at a cost of about $3,500,000. Work planned for 1931 includes the following items: Passenger station building, $2,400,000; express building, $500,000; power house, $100,000; engine house, $83,000; Western Hills viaduct, $1,200,000; grading, $878,000; Dalton St. underpass, $215,000; bridges and retaining walls, $687,000. These figures, aggregating $6,063,000, represent the amounts to be spent during 1931 and not the total costs of the several works listed.

Lackawanna Suburban Electrification—Electric operation was started on Jan. 22, 1931, on the last of the five sections of the northern New Jersey suburban electrification project of the Delaware, Lackawanna & Western Railroad. The project involved 70 miles of line, carrying 160 miles of track. This road is the first and only one in the United States to use multiple units at 3,000 volts direct current. Electric operation first started early in September, 1930.

Reading Railroad Electrification — Electrification of the Reading Railroad's line from Philadelphia to West Trenton, N. J., is well along toward completion, especially at the Philadelphia end, where the work was first started. It is expected that this line will be put into service during the latter part of 1931, also the electrified portion of the Doylestown line. The total mileage in the present work is about 70; extension to New York is under consideration.

Pennsylvania Railroad Electrification—The electrified line from West Philadelphia into the Pennsylvania Railroad's new suburban terminal in Philadelphia was put into service in September. Earlier in the year electrified local and suburban service on the main line was extended 33 miles to Trenton, N. J., and on the Schuylkill division as far as Norristown, 17 miles out. At New York the change-over of the existing system to 11,000 volt overhead contact system used in the Philadelphia zone is well along, and work on its extension south toward Trenton is in progress as far as New Brunswick, N. J. The Pennsylvania now has 354 miles of electrified line in service.

Pennsylvania Terminal, Philadelphia—The first units of the new passenger terminal of the Pennsylvania Railroad in Philadelphia, the suburban stations at Broad Street, in Philadelphia, and in West Philadelphia, were put into service in September. The transfer of suburban traffic to the new line released a large part of the area to be occupied by the new main terminal in West Philadelphia and work on that is now under way. It is expected that this station will be ready for service late in 1933. When it is completed only suburban electrified trains will run into Broad St. to the new underground station. The old Broad Street station will then be torn down to make way for a new boulevard along the site of the present elevated approach to that station.

Rapid-Transit Developments

New York Subways—With the exception of the Sixth Ave. link between Eighth and 53d Sts. all of the lines of the New York municipal independent subway system are now complete or under contract. Fifty-five route miles involving 193.4 miles of track have already been contracted for, an excess over the original plans for the system, announced in 1925. The independent system covers the four boroughs of Manhattan, Brooklyn, Queens and the Bronx. To the first of the year a total of $384,917,850 in construction contracts had been let on the new system. Equipment, station finish, track, substations and storage yards bring the total to $432,041,685. Adding to this the amount of contracts let by the New York board of transportation for work in connection with the present Interborough Rapid Transit and Brooklyn-Manhattan Transit systems, including the new Nassau-Broad St. link and the Fourteenth St. extension, the grand total of subway contracts awarded by the board since 1925 reaches $487,592,391. This amount does not include $35,000,000 paid for real estate, most of which will be resold, or $31,967,059 engineering and administration expenses. During 1930 the board awarded subway contracts totaling $87,544,076, of which $68,991,339 was for construction and the remainder for track, signals, station and miscellaneous equipment. Contracts for the Sixth Ave. section, which will complete the independent system, will soon be let. This work is estimated to cost $40,000,000.

Philadelphia—Present rapid-transit facilities in the central part of Philadelphia consist of two lines extending east and west along Market St. and north and south along Broad St. These cross at the City Hall. Construction of a third line, which will cost approximately $50,000,000, has been started. This line leaves the present Broad St. subway at Ridge Ave. and will extend in a southwesterly direction as far as 49th St. At present three sections, amounting to more than 12,000 ft. at a cost of approximately $12,300,000, are under contract. Two of these were awarded in the spring of 1930, the third on Dec. 30. Work on the first two contracts is 60 per cent complete.

The Market St. line now operates as a subway as far as the Schuylkill River, where it emerges and extends westward as an elevated railway. The city intends to extend underground operation westward from 24th to 46th St., replacing the elevated line. This work requires the construction of a four-track tube under the Schuylkill River and of a new Market St. bridge, which in turn involves building a temporary bridge to provide for Market St. traffic during the period of construction. Of the total cost of $29,000,000 the sum of $7,000,000 has already been appropriated. The river section of the work, between 24th and 30th Sts., is now under construction, and the temporary highway bridge with its approaches is near completion. A second project, covering the section between 30th and 32d Sts., is practically ready for bids.

Preliminary work for the extension of the Broad St. subway from South St. to Snyder Ave. has been actively begun, and plans and specifications are nearly ready for bidding. This project involves approximately 7,300 ft. of two-track subway including three stations. Construction is also proceeding on an underground concourse under the City Hall.

Chicago Subways—The year in Chicago has seen the local transportation situation emerge from politics and legal fog to the materialistic realm of the engineer for a time sufficiently long to get 200 plans drawn for a meager 2-mile stretch in State St. The whole proceeding is now back in the lap of the law. Court hearings are being held, pending confirmation of the special assessment roll made up in conformity with the ordinance passed Dec. 15, 1930. The plan is to assess abutting and adjacent benefited property for 65 per cent of the cost of the subway. The remainder is to be paid from a traction fund accumulated since 1907 from the city's 55 per cent share of net profits accruing to the surface line companies. Should serious legal objections to the assessment roll develop, construction may easily be held up a year. As the rapid-transit elevated lines are primarily to be the users of the subways, an effective consolidation or merger of all local transportation must be effected so that a tenant for the city-built subway will be assured. The merger was to have been effective last fall in accordance with city ordinance, but the date has been twice extended and still further time may be needed.

Rapid-Transit Line at Milwaukee—An electric rapid-transit line, free from grade crossings and connecting suburban districts directly with the business section of Milwaukee, Wis., was put into operation in September by the Milwaukee Electric Railway & Light Co. to supplement its street-car system and to attract suburban traffic by reason of high speed and regular schedule service. The project was initiated and carried out by the company at its own expense, the total cost, exclusive of land, being about $4,000,000. At present the line ends at the edge of the business district, where the cars are diverted to the surface tracks, but later there will be a subway and terminal loop.

Other Important Projects

New Jersey Meadows Viaduct—Highway traffic to and from the Holland tunnel will be carried over the meadows between Jersey City and Newark by a 15,000-ft. elevated road with a clear width of 50 ft. between curbs. Included in the project are two duplicate cantilever bridges, 550-ft. spans, over the Hackensack and Passaic rivers. Foundation work for the entire structure is well along toward completion, with the exception of a short section at the west (Newark) end, for which the contract has just been awarded. For the superstructure, erection has been started on the Hackensack cantilever, and will begin on the Passaic span early in the spring. Contracts for the viaduct sections will be awarded in the near future.

New York Elevated Highway—Use of the lower section, extending from Canal to 22d St., of the elevated vehicular highway along the Hudson River waterfront in New York City was started on Nov. 13, 1930. Plans for the central section have been held up pending a war department decision on long piers which might have affected the route, but these are now in process of preparation and it is expected that bids will be called for in about a month. Foundations for the highway section over the 60th St. yard of the New York Central Railroad are more than 50 per cent complete, and a contract for the superstructure on that portion of the road extending from 59th to 72d St. has just been awarded.

Chicago World's Fair—This past year saw the beginning of active construction work for the international exhibition which is to be held at Chicago in 1933. Its site on the lakefront has been formed by pumping in sand for what will be an extension of the city's lakefront park system. Two of the main buildings, both of steel frame construction, have been erected. The first of these is the Administration Building, which is already occupied by the World's Fair offices and is to remain permanently as the office building of the South Park Commission. The second structure is the Travel and Transport Building, 1,000x145 ft., with a circular annex 200 ft. in diameter which is roofed by a steel dome suspended from a series of cables. Main buildings planned for construction in 1931 include the electrical group, 1,045x320 ft., to cost $950,000, the general exhibition building, 608x600 ft., $800,000, and the Mayan temple, $150,000. About 100,000 sq.yd. of paving has been laid for the new outer drive, costing $400,000, and some stormwater sewers.

Modern electrically operated tower excavator building levee in the Birds Point-New Madrid floodway

Progress in Mississippi River Flood Control

A summary by the staff engineers of the Mississippi River Commission of the expenditures made and the construction accomplished in two and a half years

THE passing of 1930 concludes the first two and one-half years of operation under the plan for flood control of the Mississippi River approved by act of Congress, May 15, 1928. A glance at the progress maps covering some 1,100 miles of river between Cape Girardeau, Mo., and the Passes, shows lengthening stretches of completed levees at the upper ends of the levee systems of various basins and districts and occasional short stretches downstream, where exigencies of caving bank or abnormal deficiency of existing embankment have required action in advance of normal schedule. Stretches of new bank paving appear here and there, and at several troublesome localities between Cairo and Memphis, groups of short lines normal to the shore indicate the beginnings of lower-river regulation by means of permeable groins. The Birds Point-New Madrid setback levee is entirely under construction and due for early completion, as are the Bonnet Carré spillway structure and its side levees. The proposed protection levees in the Boeuf and Atchafalaya overflow basins are as yet untouched, but Arkansas River levees and Red River levees, at the heads respectively of the Boeuf and Atchafalaya basins, are well on the way to completion, as is the new levee across the base of the Bayou des Glaizes loop.

Funds Obligated and Expended

To December, 1930, $89,000,000 had been made available. Of this sum, about $64,300,000 has been expended, and the balance is practically all obligated. In addition, $3,000,000 was recently allotted to flood control under the special emergency appropriation for relief of unemployment, and this also has been obligated to operations that will exhaust it before June 1 of the present year. In round numbers then, about $92,000,000 has been obligated and about $64,300,000 expended. The obligations named above do not include commitments for the fiscal year 1932 under continuing contracts.

Expenditures have been distributed as follows to the several major divisions into which the activities prescribed by the project and act may be grouped:

Mississippi, Red and Arkansas rivers levees	$28,000,000
Bonnet Carre spillway	5,600,000
Rights-of-way, flowage and drainage	1,200,000
Revetment and revetment plant	19,400,000
River regulation (contraction works)	2,200,000
Dredging	3,200,000
Surveys, mapping, collection of physical data, flood relief, emergency levee repairs, tributary levee construction	4,700,000
Total	$64,300,000

The first three items of the table relate directly to flood-protection work and aggregate $34,800,000, or 54 per cent of the total expenditures. The succeeding two items, comprising $21,600,000, or about 21 per cent, relate to river stabilization and regulation; the next item, $3,200,000, relates to improvement for the sole purpose of navigation, and the last item comprises a general miscellany relating directly or indirectly to practically all the major features of the project.

A comparison of expenditures to date with estimated total costs, appearing in the report of the reviewing board appointed under the flood-control act, is shown in the accompanying table. The figures indicate that progress on revetment work and dredging is well ahead of schedule.

Item	Estimated Total Cost	Expended to Date	Per Cent of of Total
Floodworks, incl. rights-of-way, drainage and flowage	$207,500,000	$34,800,000	17
Revetments	80,000,000	19,400,000	24
Contraction works	20,000,000	2,200,000	11
Dredging	10,00,000	3,200,000	32

The required expenditures for dredging are too largely a function of river-stage sequence to permit close adherence to a predetermined annual rate. The extreme low-water condition of 1930 for example, requiring the

dredging of 7,710,000 cu.yd. may not recur for many years—yet may be even more severe in 1931. Dredging demands should of course decrease as contraction works become increasingly effective.

Contraction Works Experiments

Contraction works represent a new step in modern lower-river improvement. They were employed at several points shortly after the creation of the M.R.C. in 1879, but the method was deemed too slow in its effects to meet the pressing needs of commerce and was soon abandoned in favor of dredging—a wholly temporary but comparatively inexpensive form of improvement. Observation of the contraction works actually installed at that time indicated that the unstable riverbed and the great height and long duration of floods made the problem of regulation below Cairo difficult. In the light of past experience, therefore, the present program is advisedly proceeding with caution. The behavior and effects of initial installations are being closely observed prior to wholesale committments. To date, permeable groins have been completed at six localities between Cairo and Helena and are under construction at four other points within the same reach. The aggregate length completed and under construction is about 50,000 ft.

Bank-Protection Problems

In the fiscal year 1929, the first under the present project, relatively large sums were assigned to revetment, a great part going into plant requirements and repair and into completion of previously initiated works during the necessary period of mobilization for the greater work of flood control. There are about 165 miles of effective revetment on the lower river. In the fiscal year 1929, about 83,000 lin. ft. of bank paving was placed; in the fiscal year 1930 about 74,000 ft., and from July 1 to Dec. 31, 1930, (practically the entire revetment working season), 64,000 ft. Experimental revetment work by means of groins is being tried in the Memphis District, and the results are being carefully observed. All new revetment projects are undertaken only as a part of a comprehensive plan of regulation.

The first cost of present types of revetment is about $300,000 a mile, to which capitalized maintenance adds, perhaps, an equal amount. The employment of so expensive an expedient can be permitted only when the results expected justify it. The development of a cheaper but satisfactory substitute for the present type of revetment is being prosecuted both in field and laboratory. During the past year a considerable portion of the revetment funds was expended in repairs and extensions of existing installations necessary to their preservation. With an increase in the volume of contraction works there will of course be a concomitant increase in new revetment undertakings.

Obviously, the most urgent of the works embraced in a flood-control project are works of flood-control, which by the same token are the most extensive of the various operations required. The flood-control works included in the adopted project embrace main-river and tributary levees, auxiliary levees in the Birds Point-New Madrid area, in the Boeuf and Atchafalaya basins and the Bonnet Carré spillway. The Bonnet Carré spillway and the Birds Point-New Madrid projects are within sight of completion. In both cases land questions are under adjustment in the courts.

Remarkable Levee Records Made

In two and one-half years over 115,000,000 cu.yd. of levee work has been placed, 70,700,000 cu.yd. of it during the calendar year 1930. The increasing tempo of this phase of the work is illustrated by the following comparison:

Cubic yards placed July 1, 1928 to June 30, 1929 (12 mo.)	23,000,000
Cubic yards placed July 1, 1929 to June 30, 1930 (12 mo.)	42,800,000
Cubic yards placed July 1, 1930 to Dec. 31, 1930 (6 mo.)	49,500,000

Thus during the past six months, earth has been moved at the rate of about 269,000 cu.yd. a day, the average haul from pit to fill being perhaps 450 ft.

This of course has required a favorable working season and a concentration of plant that was not to be expected during the earlier days of the project.

By far the greater part of work has been done by contract. During the calendar year 1930 only 11,000,000 cu.yd., or less than 16 per cent of the 70,700,000 cu.yd. placed, was moved by federally owned plant.

Excellent working conditions and large volume of work have resulted in some exceptional outputs, with claim and counter-claim for broken records. Noteworthy, at least in the field of individual performance, is government tower machine C-8, steam-operated and purchased about 1920, which placed over a million yards in four and a half months. This machine averaged 3,147 cu.yd. per eight hour shift, and 458 cu.yd. per hour of actual operation, it is claimed.

Among the contractors one construction company with an electric tower machine and one wagon and tractor outfit (the wagon and tractor outfit starting work on April 1 and the tower machine on June 1), is expected to place 1,900,000 cu.yd. by Feb. 1, 1931, and has already placed (to January, 1931) about 1,800,000 cu.yd.

Both of these records were made in the northern area of the Vicksburg District. This area placed about 7,000,000 cu.yd. by contract and hired labor from April 1 to Nov. 30, 1930, with a force consisting of four tower

Bonnet Carré spillway 7,000 ft. long, designed to reduce flood heights at New Orleans by diverting 250,000 sec.-ft. into Lake Pontchartrain

machines, one 125-lb. boom dragline and eight tractor-wagon outfits, each comprising about six tractor-wagon units and a loading unit.

Despite the incentives, little of lasting worth has so far been evolved in the way of new types of earth-moving machinery. The soundest developments have been in the direction of improvement of existing types and in their coordinated group operation.

Incidental Operations

Incidental operations, specifically or by implication, called for by the plan and act have been wide in scope and variety. Levee construction on the upper Mississippi and on tributaries under the federal-aid provisions of section 6 of the flood-control act has obligated about $1,600,000 of United States funds, matched by half as much provided by local interests. Section 10 of the act authorized the use of $5,000,000 for surveys, investigations and reports (under H. D. 308, 69th Congress, 1st session) on various features relating to the improvement and development of tributary streams, including the control of their floodwaters and its effects upon Mississippi River floods. Of this sum $1,200,000 has been used to date. The project called for a topographic map of the alluvial valley. To date, about 9,000 square miles is ready for publication and the remainder far advanced toward completion. The map will be published to a scale of 1:62,500 and will show 5-ft. contours.

The collection of physical data has involved the maintenance of gages, local surveys and observations of various sorts, including some 3,000 independent sets of stream-discharge measurements, in conjunction with many of which sediment observations were also made. The hydraulic laboratory at Vicksburg was constructed during 1930 and has begun to function. Slightly more than a million dollars has already been expended in flood relief and in repair of flood-damaged levees on tributaries.

Plans for the next fiscal year, which begins July 1, 1931, have been in process of formulation for several months, predicated upon an assumed appropriation of $35,000,000, practically half of which is to be devoted to levee construction and one-fourth to revetment and contraction works.

Construction Data and Prospects

An all-time high record will be reached by public works in 1931, with a total of $3,800,000,000, which is two hundred millions above the 1928 figure. At the same time all construction will go about 12 per cent above 1930, to $8,700,000,000.

December was the worst month of the 1930 depression. For the year as a whole all business indexes are subnormal. Construction volume and material production were down 15 to 25 per cent, construction costs 15 to 20 per cent.

A strong bond market, reviving business and a high public-works budget make the outlook at least fair.

DURING the eight years 1921-28 the annual value of contracts let increased steadily from 3½ billions in 1920 to 10 billions in 1928, and the increase was quite evenly distributed throughout the industry. The absolute volume as well as the dollar value of construction increased steadily, by an average of 36 per cent per year. In the nature of things this rapid expansion could not continue indefinitely, and the increase of 9 per cent in 1928, the last of the booming years, was matched by an equal drop in 1929.

Construction Decreased 15 Per Cent

A further drop in construction of 15 per cent was recorded last year. The dollar value went down to 7.8 billions in 1930, about the average of the 1924-25 construction totals.

This drop took place in most classes of construction, but was most severe in buildings. As in 1929 the greatest decrease was in residential building, 42 per cent, as compared with 31 per cent the year before. The falling off in other types of buildings amounted to 25 per cent.

On the other hand public works contracts rose by a small percentage, remaining not far below the peak record of 3,622 millions established in 1928. This increase appeared in practically all kinds of public works: bridges, drainage and harbor work, and roads; the only decreases, in sewers and buildings, amounted to 7 and 3 per cent respectively.

New England was the single region of the country that increased both its public and its private construction, the total going up 11 per cent. Private work dropped 30 per cent in the Middle Atlantic states, 44 in the South, 47 in the Middle West, and 24 per cent west of the Mississippi. Both the growth in 1923-28 and the deflation in 1929-31 well illustrate the close relationship between construction and national prosperity. A look at the graphs in Fig. 1 is instructive.

The top years were 1928 and 1929. Even the sharp reaction to the stock-market crash in October of the latter year failed to reduce annual indexes below the high readings of 1928. In percentages some of the increases were: productive corporation capital issues, 20; public bond sales, 10; passenger automobile production, 19; motor trucks, 25; manufacturing employment, 4. There were decreases in wholesale prices and in the number of commercial failures. Financial conditions were satisfactory until October. An average call loan renewal rate of 7.62 per cent for the year, compared with 6.05 the year before and 3.35 the year after, indicates the readiness of the public to absorb any and all grades of paper. Although 1928 had issued the largest volume of securities in history ($8,114,395,681), 1929 exceeded it by 20 per cent. Although 1928 stock-market transactions had taxed the capacity of the market to handle them, stock sales in 1929 were 20 per cent heavier and bond sales 3 per cent heavier. Yields on bonds also were satisfactory, industrials and public utilities averaging 3 per cent above 1928, municipals 5 per cent above, rail-

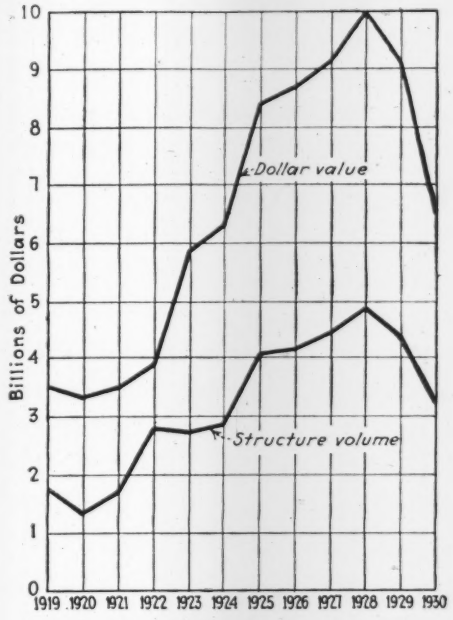


Fig. 1—Actual and absolute (1913) dollar value of construction

TABLE I DOLLAR VALUE OF CONSTRUCTION

(In Millions of Dollars)

	Residential	Public Works	Other	Total	E. N.-R. Cost Index
1919	1,160	1,640	740	3,540	198.42
1920	706	1,470	1,204	3,380	251.28
1921	1,100	1,510	860	3,470	201.81
1922	1,675	1,780	1,445	4,900	174.45
1923	1,980	2,300	1,590	5,870	214.07
1924	2,120	2,500	1,610	6,230	215.36
1925	3,000	2,594	2,806	8,400	206.68
1926	2,910	2,847	2,943	8,700	208.03
1927	2,800	3,488	2,872	9,160	206.24
1928	3,020	3,622	3,358	10,000	206.78
1929	2,080	3,121	3,929	9,130	207.02
1930	1,200	3,139	3,461	7,800	202.85

TABLE II—VALUE OF CONSTRUCTION BASED ON 1913 COSTS

(In Millions of Dollars)

	Residential	Public Works	Other	Total
1919	585	825	373	1,783
1920	281	586	480	1,347
1921	547	750	427	1,724
1922	960	1,020	830	2,800
1923	925	1,072	743	2,740
1924	987	1,160	743	2,890
1925	1,450	1,250	1,350	4,050
1926	1,400	1,370	1,360	4,130
1927	1,360	1,690	1,380	4,430
1928	1,460	1,765	1,620	4,830
1929	1,000	1,510	1,900	4,400
1930	580	1,545	1,705	3,840

roads 3 per cent below. Commercial interest rates were 8 per cent lower than in 1928.

Nevertheless, the year's construction volume dropped below 1928, housebuilding slumping decidedly.

The 1930 drop was more serious than that of 1929 not only in amount but in effect, being the second consecutive annual decrease. The indexes reflecting the conditions that accompanied the drop were: corporation capital issues, down 10 per cent; public bond sales, down 7; passenger automobile production, down 13; trucks, down 33; manufacturing employment, down 13 per cent. The wholesale commodity price index declined 10 per cent.

Construction figures in three groups are given for a twelve-year period in Tables I and II. Their course is exhibited more graphically in Fig. 1.

Reduced Production of Materials

Production Down 25 Per Cent—Both production and shipment of construction materials were below 1929 levels as might be expected and with a single exception were below those of 1928. The exception was fabricated structural steel shipments, which because of accumulated orders were 3 per cent heavier than in 1928 and only 3 per cent below those of 1929. Shipments and bookings reached their lowest point in the last week of the year.

Table III shows 1930 production, shipments and stocks as percentages of 1928 and 1929 figures. The story is read at a glance: activity in the materials of heavy construction is down in proportion to the 15 per cent drop in volume; building materials are down in proportion to the 30 per cent drop in building.

How Materials Prices Decreased—Of 57 materials items on which prices are quoted monthly in *Engineering News-Record*, 45 are lower than they were a year ago; 12 unimportant items are higher in price. The average minimum decrease from a year ago in delivered prices of eight materials in twenty cities are: cement 4 per cent; gravel and sand, 7 each; crushed stone, 11; common brick and hollow tile, 5; common and hydrated lime, 3 each; a general average of 6 per cent. The over-all reduction in prices of lumber delivered by dealers is 4 per cent. Prices of concreting materials are down 7 per cent. Mill prices of materials are down 10 per cent. The strong activity in road building this year is reflected in a small rise in prices of paving materials.

Among the major materials the principal market activity was in structural steel. The price was successively lowered, from $1.90 in January to $1.80 in February, to $1.75@$1.80 in May, to $1.70 in June, to $1.65 in July, to $1.60 in September, $1.60@$1.65 at present. This is a drop of 16 per cent at Pittsburgh for the year. On the whole, finished steel has dropped 10 per cent in price, pig iron 13 per cent, scrap 11 per cent, cast-iron pipe 6 per cent. A noteworthy feature of the closing months of the year was the increase in steel prices by 5c. per 100 lb.

The outlook for brick at the beginning of 1930 seemed

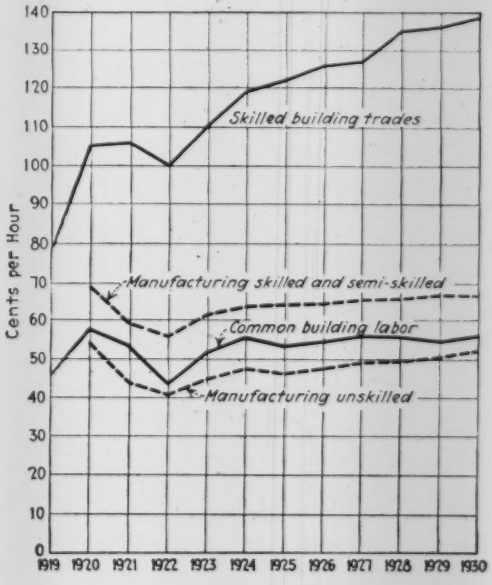


Fig. 2—Building and manufacturing wages

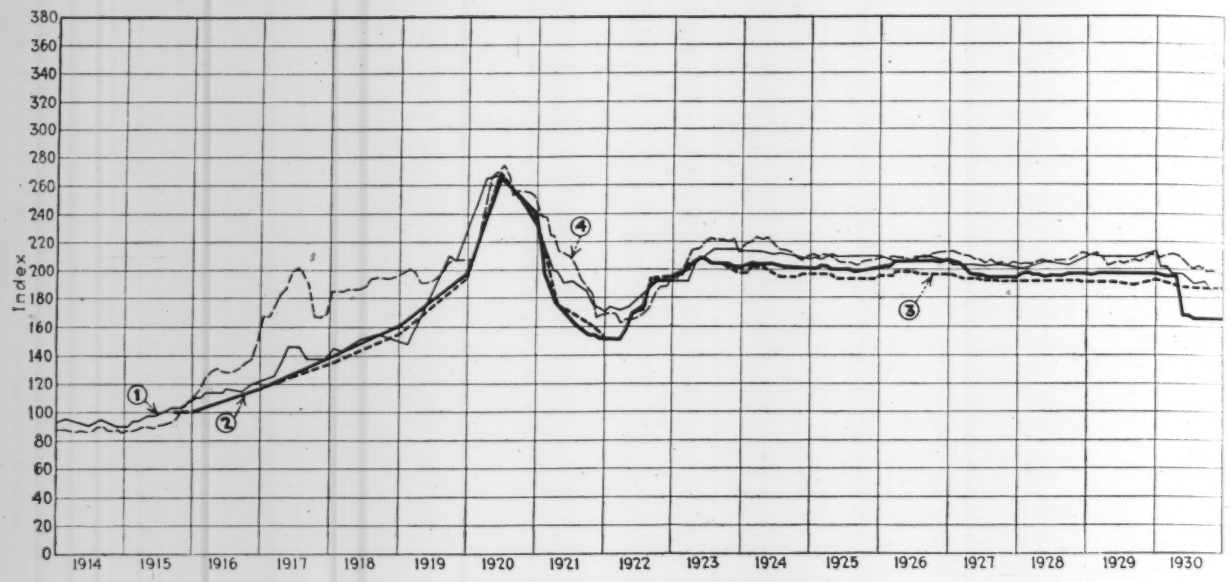


Fig. 3—Building and general construction costs

Building cost curves: (1) Tilghman-Moyer index of bank buildings; (2) Morton C. Tuttle index of industrial building costs; (3) Aberthaw index of typical reinforced-concrete factory. (4) *Engineering News-Record* Cost Index

to be good. In the Hudson Valley, for example, only six plants were operating, and a shortage was predicted. But by March brick at New York was cheapest since 1918. In September it was reported that a third of all plants in the country were shut down and that some, after a year's idleness, still had brick for sale. The only hope for improvement is in a continuation of the recent upturn in residential building.

Cement prices at eighteen mills averaged $1.73 on Jan. 1, 1930, and $1.58 one year later, a drop of 9 per cent. By far the most important event of the year in this industry occurred in November, a reduction of the dealers' trade discount from 10c. per barrel payable currently to 5c. to be paid at the end of twelve months. In December, dealers in New York and Philadelphia raised prices 13c. and 5c. respectively. At six mills prices were lowered 8c. In the week of Dec. 22 manufacturers' official f.o.b. quotations were withdrawn at fourteen important Mid-Western cities pending decision on a new price schedule not yet announced. The expectation of the industry is for a sounder business year with elimination of price cutting by dealers.

Prices May Rise

What is the expectation for building materials prices generally? In the main it is that they will not go lower, for the reason that construction volume is not expected to go lower. In fact, one of the extremely scarce favorable signs of the business times is *a rise in construction volume in January*. Should this rise develop into a definite trend, then prices are certain to rise also, as they have done under similar circumstances in the past. In 1922, for instance, when costs had reached the low point in March, they increased 14 per cent in the next six months and 37 per cent in sixteen months.

Costs Down 6 to 20 Per Cent—Construction costs dropped with the general decrease in prices. A survey conducted by *Engineering News-Record* in September developed that the prices of all structures, of dams, tunnels, reservoirs and roads, as well as of buildings, were 8 to 15 per cent below the Jan. 1 level. Further evidence of low costs has continued to accumulate. In last week's issue W. J. Barney furnished data showing that building costs, including subcontract prices, are 20 per cent below those of the last three years. In the same issue data from Detroit showed reservoir construction to have decreased 18 per cent in two years.

Fig. 3 shows building costs as computed by three prominent contractors and general construction costs as indicated by the *Engineering News-Record* Cost Index.

Wages and Employment

Employment Low but at Union Rates—Unemployment in the building trades for the year is estimated by the American Federation of Labor at 39 per cent, against

TABLE III—PRODUCTION, SHIPMENTS, STOCKS
1928 = 100

	1930	1929
Steel ingots	80	73
Cement	93	96
Lumber	85	77
Floor, wall tile	61	63
Malleable castings	67	62
Shipments		
Fabricated structural steel	103	97
Cement	91	96
Lumber	81	78
Enameled sanitary ware	57	66
Floor, wall tile	69	75
Malleable castings	71	64
Porcelain plumbing fixtures	38	69
Prepared roofing	77	71
Vitreous china plumbing fixtures	67	71
Stocks		
Cement	129	126
Lumber	129	108
Floor, wall tile	115	78
Porcelain plumbing fixtures	62	76
Vitreous china plumbing fixtures	107	93

TABLE IV—PUBLIC BOND SALES AND FEDERAL GOVERNMENT APPROPRIATIONS FOR CONSTRUCTION

(In Millions of Dollars)

	Municipal Financing	Corporation Financing	Federal Government	Municipal, Corporate and Federa
1919	1,220	2,023	788	4,031
1920	1,439	2,348	422	4,209
1921	2,149	1,664	421	4,234
1922	1,615	2,006	325	3,946
1923	1,650	2,503	248	4,401
1924	2,426	2,835	310	5,571
1925	2,272	3,178	309	5,759
1926	2,024	3,247	274	5,545
1927	2,105	3,765	290	6,160
1928	2,107	3,729	304	6,140
1929	2,327	4,481	352	7,160
1930	2,163	4,031	285	6,479

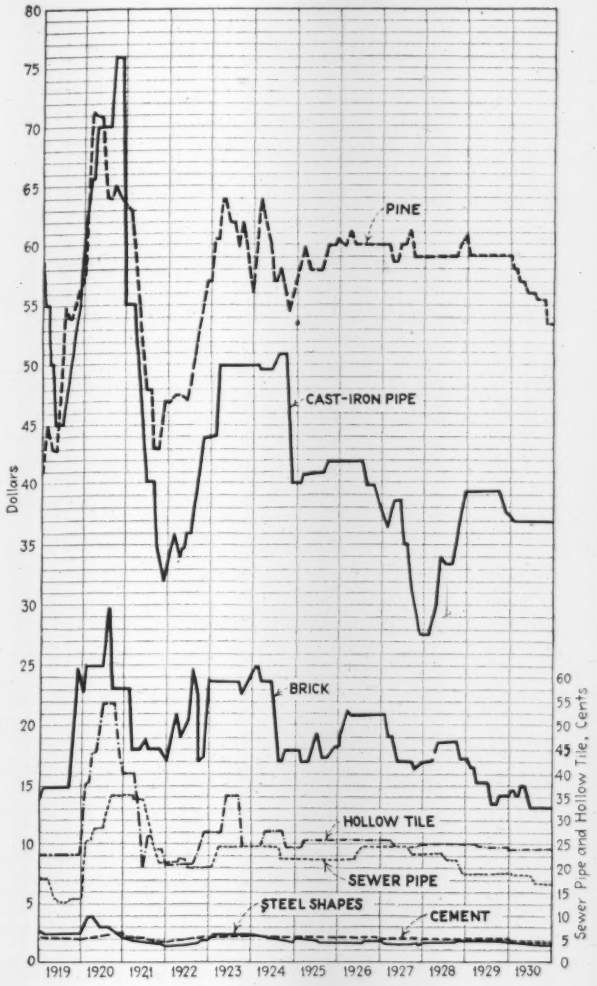


Fig. 4—Twelve-year trend of materials prices

21 per cent for all vocations; in 1929 the figures were 22 and 11 per cent respectively. February, 1930, unemployment in the unions was reported largest in three years. In June the National Building Trades Employers Association estimated four unemployed men in the skilled building trades to one with a job; present unemployed 50 per cent, compared with 19 a year ago.

Yet, in spite of the severity of the unemployment, union wages have been maintained quite successfully except in smaller cities and among lesser contractors. The widespread maintenance of the regular scale has been possible (1) because of agreements between contractors and unions, (2) the willingness of contractors to pay the rate for efficient labor, (3) a belief among many that breaking the wage scale would increase neither building volume nor unit labor output and might increase unit labor costs.

Skilled wages in the building trades averaged $1.38, against $1.36 in 1929; common $0.5607, against $0.5465. Comparison of today's wages with those of a year ago, however, shows the skilled rate the same, but common wages down 4 per cent. There are no exactly comparable wage data in manufacturing. The average skilled and semi-skilled wage in the last two years was the same, with unskilled wages down 1 per cent. Present figure for skilled and semi-skilled is $0.664, against $0.672 a year ago; unskilled $0.49, against $0.501.

Another important item to consider in comparing construction wages with those of other industries is the seasonal and otherwise fluctuating nature of construction employment. Normally the construction mechanic or laborer works 210 days per year, against about 270 for the factory operative. This in itself reduces the laborer's wage 22 per cent as compared with the lower but more steadily received rate of the plant hand. Thus, while the building scale is undoubtedly higher than the industrial scale, there is much more time off between jobs and due to bad weather.

Construction Money

An interesting phenomenon of 1930 is that, though it was a depression year, the money provided for construction and production purposes was only 10 per cent below the total provided in 1929 and was 5 per cent more than in 1928, and more than in any year preceding 1929. This was doubtless due to curtailment in stock-market transactions and the consequent permanent investment of capital accumulations. Monthly stock sales averaged 27 per cent fewer than in 1929, and the par value of bond sales was 10 per cent less.

Another phenomenon is the fact that in spite of tremendous efforts to develop practical public works plans, state and municipal bond sales totaled 9 per cent less than in 1929, and estimated federal government construction expenditures were 19 per cent below (Table IV). The reason for the drop in bond sales was a condition of uncertainty toward the banking situation that developed in the latter part of the year. The reason for the uncertainty was (1) a string of bank failures culminating in an important failure in New York; (2) expected heavy demands on the banks for cash and consequent heavy selling of bonds by the banks. The result was that the bond market, which had been improving throughout

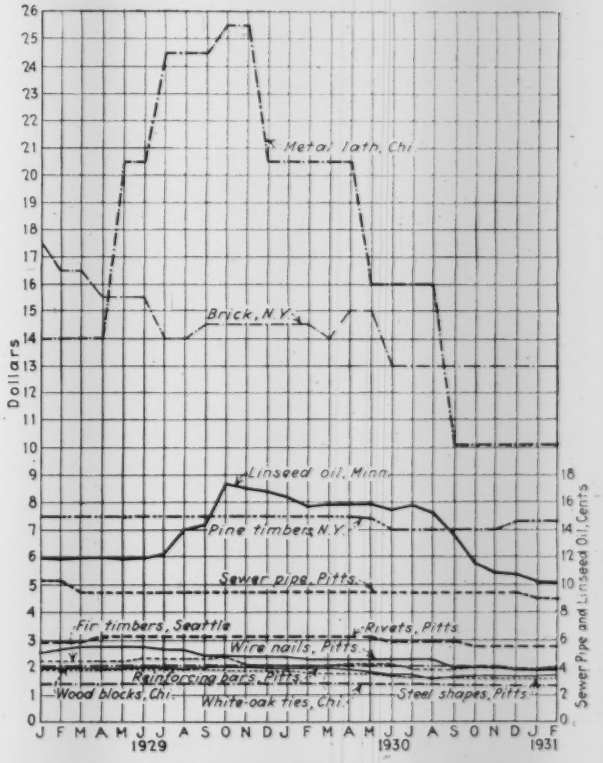


Fig. 5—Trend of materials prices in 1929-31

the year and reached the peak on Oct. 1, became soggy and in the third week of December almost panicky.

The situation has since changed. Short-term obligations, at least, are in exceptionally good demand, and command prices considerably higher than at any time in the last year and a half. An instance is a recent issue by Rochester of $1,700,000 short term notes at a cost less than 2 per cent. Four prominent New York houses competed for the issue: one for seven months at 1.94 per cent, and two for 1½ months at 1.34 per cent—extraordinarily low cost. The year 1931 opened with an average yield on big-city bonds of 4.12, against 3.97 high on Oct. 1, 1929.

This is some evidence warranting the present optimism of the bond dealer. The demand for bonds is not only very strong; it is strong enough to absorb the heavy output of new issues planned for the next 60 to 90 days. This activity, moreover, is general in the bond market, extending to the railroads, utilities and industrials as well as to municipals. The relation of bond sales to construction is shown in Fig. 7.

Another item of importance as throwing light on probable building activity this year is the cost of money for banking and commercial purposes. Curves of interest rates on four to six months commercial paper and of building contracts show distinct inverse agreement and a pronounced tendency for interest rates to lead contracts by one year. During the last 30 years this relationship has held for two years out of three, and remarkably so since 1924. Commercial paper rates have been falling from 6.13 per cent in October, 1929, to 2.75 per cent this week. Therefore unless the precedent of the last seven years is to be broken, it is reasonable to look for increasing building activity this year.

Construction Prospects Good

It is generally conceded that December was the worst month of the business depression. The two depression periods 1920-21 and 1929-30 have a similar characteristic (Fig. 6). In both periods volume dropped steadily throughout the first year to low points respectively in January, 1921, and December, 1929, then rose seasonally. But whereas the 1921 curve is symmetrical for the year and the winter drop small, the 1930 curve started downward in May, fell sharply in June, and was continuing down in December. Recovery from the 1921 depression began with a strong rally in March, 1922. It may therefore be significant that January has recorded the same volume as a year ago and an increase of 17 per cent over December. The January, 1930, total was 47 per cent below the preceding month and 39 per cent below that of January, 1929.

The 1931 outlook for construction is more than promising. Public works are budgeted for a record high, exceeding 1928, as given in the accompanying table. This is compiled from a country-wide survey conducted by *Engineering News-Record* during the last two months. The indicated total of all construction is at a figure near to the 1929 dollar amount, and about 12 per cent better than the figure for 1930.

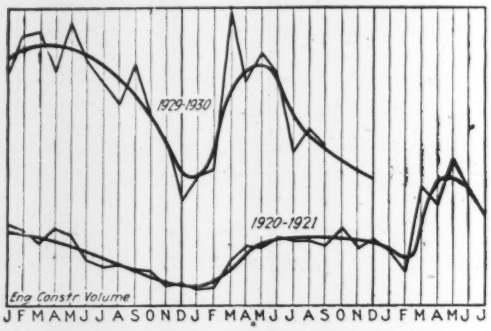


Fig. 6—Absolute construction in the 1921 and 1930 depressions

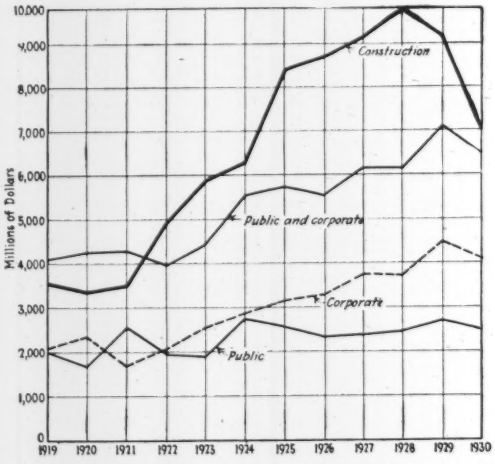


Fig. 7—Public bond sales, corporation capital issues and total construction

Public utility construction will decrease somewhat. The past year was very active in the railroad, central station and telephone fields. Railroad expenditures for roadway and structures were 15 per cent heavier than in 1929, while in power the increase was 11 per cent and in telephone 2 per cent. This year's budgets are a little lower: 11 per cent lower for the railroads, 7 per cent for the power industry, no change in the telephone total. The three budgets total close to two billions.

Building Construction Forecast

Buildings comprise the other half of the construction industry. In this field the only quantitative forecast is the annual survey of the *Architectural Forum*. This survey indicates an increase of 9 per cent for the year. Reasons given for the expected increase are (1) that volume of building through normal channels will probably equal 1930 volume; (2) larger volume of public building; (3) lower building costs; (4) improvement in mortgage conditions and financing of building; (5) upturn in institutional and residential building; (6) better workmanship in construction demanded by owners and by financial interests.

UNITED STATES CONSTRUCTION TOTALS AND THE 1931 ESTIMATE

Engineering News-Record Compilation

	1928	1929	1930	1931
Public works	$3,622,000,000	$3,121,000,000	$3,139,000,000	$3,824,000,000
Utilities	1,258,000,000	1,495,000,000	1,670,000,000	1,473,000,000
Industrial	690,000,000	825,000,000	500,000,000	550,000,000
Commercial	1,410,000,000	1,609,000,000	1,291,000,000	1,485,000,000
Dwellings	3,020,000,000	2,080,000,000	1,200,000,000	1,380,000,000
Totals	$10,000,000,000	$9,130,000,000	$7,800,000,000	$8,712,000,000

NEWS OF THE WEEK

Apportionment of Flow in Delaware River Recommended

CURTAILMENT to an average of 440 million gallons a day of the proposed diversion of 600 m.g.d. of water from the tributaries of the Delaware River for an additional water supply for New York City is recommended by Charles N. Burch, special master, in a report submitted Feb. 2 to the U. S. Supreme Court in the case of State of New Jersey vs. State and City of New York (Commonwealth of Pennsylvania, intervenor). The master advises absolute denial of New Jersey's plea for an injunction against any diversion on common-law grounds, declaring instead for "equality of right" and "equitable apportionment" between states.

The various specific claims of injury to power, navigation, public water supplies and other interests are admitted in the report, but generally are held to be slight, though still considerable enough, as a whole, to demand relief. It is to give this relief that the master recommends not only limiting the diversion but also a more liberal plan for discharging stored water down the Delaware than was proposed in the New York project. A minor exaction is that New York City shall provide works to treat the sewage of Port Jervis, which it has already offered to do. The master disapproved as premature and unjustified Pennsylvania's request for an allocation to that state of 750 m.g.d. from the Delaware.

Both New York and New Jersey are expected to file exceptions to Mr. Burch's findings before they are acted upon by the supreme court. More complete details of the report will be given in a later issue.

Nominations for A.W.W.A. Officers Are Announced

Members of the American Water Works Association have been notified of the selections of the nominating committee for the offices of the association for 1931-32. In case no independent nominations are filed, these nominees will be considered elected.

The nominations are as follows: for president, Ross L. Dobbin, superintendent of water-works, Peterborough, Ont., Canada; for treasurer, William W. Brush, chief engineer, department of water supply, gas and electricity, New York City.

The 51st annual convention of the association will be held at Pittsburgh during the week of May 25. The publication committee promises a very complete and diversified program.

Contracts Let for Railroad and Highway to Hoover Dam

Contracts for the construction of the railroad and highway from Boulder City to the site of Hoover Dam have been awarded by the department of the interior.

The award for constructing the railroad was made to the lowest of sixteen bidders, the Lewis Construction Co., Los Angeles, Calif., for $455,509.50. Contract for constructing the highway also went to the lowest of twelve bidders, the General Construction Co., Seattle, Wash., for $329,917.15. In both cases the bids accepted were lower than the estimates.

Work on the railroad will be started within 30 days of receipt of the notice of the award and is to be completed within 200 days. Work on the highway will begin within twenty days and must be completed within 140 days.

I.C.C. Cannot Compel Railroad to Build Line

The U. S. Circuit Court of Portland, Ore., has enjoined the Interstate Commerce Commission from enforcing its order to the Union Pacific Railroad to build a cross-state railroad from Crane to Crescent Lake. The decision, the first of its kind, came in a suit brought as a test of the power of the commission to force a railroad to build against its will. The ruling held the Interstate Commerce Commission had exceeded its authority in issuing the order.

Illinois Engineers In Sectional Sessions At Annual Meeting

EXERCISE of its activities through technical sections and local chapters is a distinguishing feature of the Illinois Society of Engineers, and its annual meeting at Rockford, Ill., on Jan. 28 to 30, was arranged with consecutive sectional sessions so that each section had its definite and adequate share of the program, while members could attend all the sessions. At this meeting, held under the auspices of the Rockford chapter, the structural section had papers on the two modern developments of structural welding and the structural uses of aluminum. In tests of welded joints in plates, made at the University of Illinois, as reviewed by Prof. W. M. Wilson, the breaks occurred mainly outside of the welds, but it was stated that these joints are not to be compared with shop welds. Applications of aluminum were shown to include light truss and girder work as well as railway cars, motor coaches, aircraft and the exterior covering of buildings. Sand and gravel were the main subjects of the mechanical and mining section, Dr. Leighton, state Geological Survey, dealing with the extensive deposits in Illinois, while the industry was exemplified by moving pictures of excavating, screening and washing plants.

In the surveying and city planning section, subjects included the city plan of Rockford, regional planning, boundary lines, the care of instruments and the

NEW POWER PLANT FOR HOUSTON, TEXAS

Construction work on the Houston Lighting & Power Co.'s two new units at Deepwater, representing an expenditure of approximately $5,000,000, will be completed by March 15, according to present expectations. When finished, the new plant will add about 50,000 kw. to the generating capacity of the Deepwater plant. The company is using 30,000,000 cu.ft. of gas daily, which is several times the domestic consumption of the city of Houston in normal weather.

engineering work of developing forest preserves for the use of the public. In the drainage section, tests of rigid and flexible pipe were reviewed, the latter under load in the trench deflecting to an approximately oval section and thus getting side support, which is not the case with rigid pipe. Another paper dealt with slides in a hillside highway cut, due to water seeping along inclined strata. These were stopped by an intercepting ditch above the edge of the cut, with tile drains laid up the slope and stone-paved drains down the face of the cut to deliver water to culverts. A typical gravity drainage district on the Mississippi was also described.

In the water-supply section the growing economic need of soft or softened water was discussed by Dr. C. H. Koyl. Extreme variations of water consumption in several suburban towns around Chicago were noted by P. E. Langdon, the average daily per capita records ranging from 93 to 240 gal. A review of Rockford's deep-well water supply and its pumping equipment by Prof. D. W. Mead, a one-time city engineer, included the old Holly and Gaskill engines at the top of the shaft with rope drive to centrifugal pumps below, and finally modern motor-driven rotary pumps in the wells.

Improved Sanitation Noticeable

That popularizing sanitation by informing the public as to the definite benefits produced has been an important influence in extending sewage treatment for large and small communities in Illinois was asserted by G. H. Radebaugh, Urbana, Ill., at the sewerage section meeting. Experience with an ordinance forbidding the discharge of oil and gasoline into the sewers at Decatur on account of detriment to the sewage filters was described by W. D. Hatfield. Other special papers dealt with treatment of packing-house wastes and the construction and operating costs of the Elgin sewage-works. A visit was paid to the Rockford works, now under construction. Problems of improving public roads where they pass through municipalities were discussed rather actively in the roads and pavements section, especially as to the contract work on these municipal links. Good roads from farm to market were advocated in another paper, while some of Chicago's important street problems were outlined by H. J. Fixmer.

For 1931 the officers are: president, Harry F. Ferguson, chief sanitary engineer, state department of health; vice-president, Hugh J. Fixmer, Chicago; secretary, H. E. Babbitt, Urbana, Ill. The 1932 meeting is to be held in Peoria.

Restriction of Immigration Is Opposed

Opposition to the enactment of emergency legislation to curtail immigration is expressed in the report of a special committee of the Chamber of Commerce of the United States which will be distributed to member organizations throughout the country for consideration at the forthcoming annual meeting to be held in Atlantic City April 28 to May 1.

The committee in its report says: "In view of the restriction of immigration already effected by administrative action under existing law to accord with the present economic conditions of the country, this committee believes there is no need for emergency legislation which could have no substantially different effect, but that new legislation upon so important a subject as immigration should await opportunity for orderly consideration of the country's immigration policy and enactment of measures which would put into effect principles which would promote the country's welfare over a period of years."

The report also points out that under strict administration of existing law in this emergency period there has already been achieved a cut of 85 per cent in the normally allotted volume of immigration from Old World countries, a reduction of 78.5 per cent from Canada, and a reduction of 93 per cent from Mexico.

A.G.C. Convention at San Francisco

Members Are Urged to Adopt the Principle of Selling Service—A. P. Greensfelder Elected to the Presidency

Engineering News-Record Staff Report

ATTENDED by 1,200 members and guests, an elaborate banquet and entertainment closed the twelfth annual convention of the Associated General Contractors of America at San Francisco, Jan. 26-30. A spirit of optimism prevailed throughout the meetings regarding the outlook for 1931 in the construction industry. Several prominent members stressed the point of adopting an aggressive publicity campaign to feature the idea of "selling service."

A. P. Greensfelder

In the keynote address of the convention, the retiring president, A. E. Horst, discussed "Construction as a Key to Prosperity" and emphasized the importance of the construction industry as a balance wheel during depression periods and a natural method for stimulating business.

Election Results

Officers elected for the ensuing year were: president, A. P. Greensfelder, St. Louis; vice-president at large, W. A. Starrett, New York; vice-presidents, W. L. Collins, New York, A. J. Parish, Paris, Ill., and C. E. Bressler, Santa Ana, Calif. Members appointed to serve as the cabinet for 1931 were A. E. Horst, retiring president, G. B. Walbridge, A. J. Parish, D. J. White and H. J. Kaiser.

By resolution formally adopted, the convention went on record as favoring the maintenance of wages and hours of labor to preserve a reasonable standard of living. The convention agreed to aid in working out a solution for the problem of convict labor that would combine humaneness with protection of existing industries. The convention counseled against the purchase of materials by public bodies in connection with public construction work. It was recommended that state legislatures be apprised of the desirability of financing public building by bond issue. The recent census of construction was highly commended and continuation of this work was urged. The convention expressed itself firmly against any principle or policy which tends toward the diversion of gas tax funds from highway construction.

An entire session was occupied in discussing and adopting some important changes in the bylaws; the vote was 60 to 8 in favor of adoption. The model prequalification bills as prepared by H. J. Kirk of the A.G.C. staff were approved. A motion was passed to appoint a committee whose duty it would be to select and make available certain men in the organization capable and willing to talk before student organizations about the construction industry.

Program Features

An address by Paul Shoup, president, Southern Pacific Co., on "Railroads of Tomorrow" pointed to the expenditures made by the nation's railways during the last two decades and predicted that the future would require continued improvement work, including improved grades, alignment and track construction to accommodate the longer and heavier trains of tomorrow.

An inspiring talk by Elwood Mead, commissioner, U. S. Bureau of Reclamation, referred to Hoover Dam as the present step in a series of future developments that will be necessary to

keep pace with growth in the Western states. Dr. Mead mentioned the growing necessity for water development and the benefits both direct and indirect that will result. In touching upon Hoover Dam construction work, he pictured the work of the contractor as great in magnitude but without complex problems. Room for construction operations at the site will be extremely limited, but careful planning of plant layout will reduce the problem to one of large-scale concrete production. Uncertainties about materials and conditions at the site are relatively less than on other projects, but the welfare of the many men and their families who must live near the dam during the long construction period warrants and has been receiving most careful thought.

Henry H. Blood, president, American Association of State Highway Officials, described the current highway program of the state and federal government. The amounts of federal appropriation, including the President's emergency fund, the states' programs and plans for work in public parks, were described in terms of millions of dollars to indicate the volume of highway construction work that will be done in the coming year.

In an address prepared by E. S. Holden, vice-president, F. W. Dodge Corporation, the outlook for 1931 in the construction industry was visioned as a year of increased construction, and attention was called to the need for increased activity within the industry in helping direct and control its proper development. Commenting upon the activity of the A.G.C. in the National Conference on Construction, Arthur S. Bent, past-president, reported on the activities of the U. S. Chamber of Commerce and the growing recognition of the construction industry as a primary force in business.

In a stimulating talk by H. J. Kaiser, director, the A.G.C. and individual members were urged to advertise their activities and their service to the public by means similar to those employed by other leading industries. Securing greater volume of business, according to Mr. Kaiser, must come as a direct result of the development work by the industry.

Divisional Meetings

At a meeting of the building division, Edwin Bergstrom, president, Allied Architects Association, Los Angeles, described the architect's work as design and the contractor's work as construction and pointed out the distinct difference in the two activities but the need for close cooperation so that the results would be the utmost in satisfaction to the owner, for whom both parties were working. W. A. Starrett, New York, reported on the trip of the delegation that attended the Fifth International Congress of Building and Public Works at London last year and also called attention to the unnecessary waste and discord within the industry from unwise and profitless competition.

Future developments of airports and the recent growth of this type of construction work were described in an address by Gen. Charles H. Danforth, commanding officer at Duncan Field, San Antonio, Tex. The general traced the rapid growth of the industry both in military and civil lines of activity and stressed the point that cities which are not properly equipped with airports of proper size and in the proper location will be distinctly handicapped in the future in this new field of transportation. O. R. McGuire, counsel to the comptroller-general of the United States, described in detail the method of disbursing federal funds for construction projects and the handling of complaints and disagreements regarding these funds by his office. He urged that contractors in general become better informed as to financial methods used in handling federal work.

At the meeting of the highway, public works and railroad division, Otto J. Amberg, president, Pacific Northwest branch, reviewed the responsibility of the construction industry to maintain a living wage for labor employed in highway construction. Discussion brought out the comment that fairness, not a desire to "charge all the traffic will bear," is essential to proper handling of labor wage problems. It is manifestly unfair to pay one class of labor four times as much as another class doing similar work solely because the former is effectively organized.

Extensive California Road Program

Charles H. Purcell, chief engineer, California division of highways, said that state road construction contracts aggregating $6,500,000 will be awarded in California within the next 60 days and that he expected to see state highway expenditures exceed $30,000,000 per year for the next ten years, this being a much more extensive program than the state has ever before faced. Keen competition and improved construction methods, he said, had brought about closer cooperation between engineer and contractor. A California highway is not "completed" when it is paved, he said; increased allowance for truck loads, increased speed, widening and traffic-hazard elimination are some of the factors that may arise after construction. Alignment is the only permanent feature of highway construction. Right-of-way is the limiting factor in the time required to get new California roads ready for traffic, this element of cost being now about 8½ per cent of that for the completed road.

H. H. Blood, president, American Association of State Highway Officials, reviewing progress on transcontinental highways, pointed out that the government owns or controls 51 per cent of the area in the eleven Western states and that heavy expenditures for through routes in sparsely settled territory are impossible without government assistance. A committee was appointed representing the highway division of the Associated General Contractors, to sit with a similar committee from the Western Association of State Highway Officials in cooperation on this subject.

Bridge Construction Delayed by Falsework Settlement

Buckling of a gusset plate on the steel falsework supporting forms for the first arch ring of the Henry Ave. bridge over Wissahickon Creek, Fairmount Park, Philadelphia, on Jan. 25 caused a settlement of approximately 3 in. at the crown of the arch and caused a temporary cessation of construction work. As a measure of safety, workmen were withdrawn from the span and all traffic was diverted from the park drive which passes underneath. At the time of the accident a number of the arch segments had been poured but none of the key blocks. Foundation settlement is believed to have caused excessive stress on the steel falsework, resulting in the failure of the gusset plate.

The bridge is being built for the city of Philadelphia by F. A. Canuso & Son, contractors. Design and construction are under the control of Modjeski & Chase, consulting engineers, of Philadelphia.

Institute of Steel Plate Construction Elects Officers

Election of officers for the Institute of Steel Plate Construction for the ensuing year is announced as follows: president, W. S. Wheeler, New Castle, Pa.; vice-president, Arthur Caverno, New York City; secretary, J. W. Poushey, New York; treasurer, B. P. McDaniels, Pittsburgh, Pa.

The aims of the institute are announced as: to promote among the members of the organization an intelligent and cordial understanding of the industry's problems; to develop by technical research new uses and broader markets for steel plates; to collect and disseminate information on all matters of interest to the industry at large and about the industry in which the general public is concerned; to establish in the industry uniform and ethical standards of practice, and in trade relations usages that are fair to all parties; to promote uniform standards and specifications, especially as relate to construction that affects the general welfare.

Commerce Department Organizes Foreign Construction Division

Organization of a foreign construction division is announced by the Bureau of Foreign and Domestic Commerce. The new unit will be in charge of H. M. Bletz, of Pennsylvania, who has been associated with the bureau for six years. The duties of the division will be technical, informational and promotional in character. The division will promote American participation in foreign construction in every way practicable, and will investigate and disseminate information regarding foreign construction, and potential use and outlets for American machinery and equipment.

Commission Urges Three Bridges Over St. Lawrence

The St. Lawrence River Bridge Commission, created by the New York legislature to make a study and comprehensive survey of the feasibility of the construction of a bridge or a series of bridges across the St. Lawrence River between the United States and Canada, has made its report. Construction of three bridges is recommended, one at Collins Landing, one on the proposed dam to be built in the development of the water power of the river near Massena, and the third about midway between these two locations, at Chimney Point. These three sites are substantially 40 miles apart.

As to financing, the commission recommends that the cost of constructing the highways and approaches on the New York side of any bridge to be built be borne by New York State and on the Canadian side by Canada, that the cost of any international span be borne jointly and that any bridge to be built be constructed under the supervision of a New York bridge authority, acting in conjunction with the proper Canadian officials.

Progress Shown in Timber Preservation

Many Data on Methods and Results of Treatment Presented at Annual Meeting of American Wood Preservers' Association

(Engineering News-Record Staff Report)

TEN PAPERS and fourteen committee reports comprised the program presented at the 27th annual meeting of the American Wood Preservers' Association, held Jan. 27-29 at Philadelphia, Pa. The sessions were well attended, and the ready discussion of individual items in the program gave evidence that the membership is giving full interest to the progressive research work being carried on through committees and by individual members.

Treated Timber in Railway Construction

Among the papers presented were two dealing with the uses of treated timber in railway construction. These were given by C. B. Musselman, chief treating inspector for the Lehigh Valley Railroad Co., and R. S. Belcher, manager of treating plants for the Atchison, Topeka & Santa Fe. Average tie replacements on the Lehigh Valley have been reduced from 177 per mile in 1910, when the company started the treatment of all ties and other forest products used, to comparable figures of 48 and 58 ties per mile in 1929 and 1930, respectively. The peak figure of 289 replacements per mile was reached in 1915. This saving has been realized without deterioration in the condition of the track, despite considerable increases in the weight of rolling stock. It has been accompanied by a marked reduction in labor cost of track maintenance, due to less disturbance of the settled roadbed, according to Mr. Musselman. Mr. Belcher detailed the various numerous ways in which the Santa Fe is using treated timber, varying from ties, trestle timbers and piles to the structural parts of track scales and molding for signal wiring. His talk was illustrated by slides showing construction details in use on the Santa Fe.

A general discussion of the uses of treated lumber in construction was given by F. O. Dufour, consulting engineer for United Engineers & Constructors, Inc., Philadelphia.

An interesting relation between the preservative life of coal-tar creosote and its toxicity, presenting the possibility of a yardstick for determining the value of a treatment before actual service record shall be available, was pointed out by Ernest Bateman, senior chemist for the Forest Products Laboratory at Madison, Wis. While admitting that the proposed test must be tried out further before it can be definitely accepted, Mr. Batemen pointed out that it has apparently worked well in several cases in actual practice, and proposed that consideration be given to its general use in order to determine its possibilities.

Laboratory tests to determine the effectiveness of certain chemicals other than creosote or zinc chloride in destroying harmful organisms and fungi were described by Ira Hatfield, of the Bureau of Plant Industry.

European Wood-Preservation Methods

One of the most interesting talks of the meeting was given by Hermann von Schrenk, consulting timber engineer, of St. Louis, who told of some unusual wood-preservation methods observed during a recent visit to Europe. Abroad, according to Dr. von Schrenk, much more attention is paid to material life because, in the average type of construction, the proportion of material to labor cost is roughly 66 per cent to 33 per cent, whereas these proportions are just the reverse in this country. Among the unusual treating practices which he observed were a water-treatment process for railway ties, in which the cylinder was first filled with hot water, then with creosote, in order to reduce retention and retain full penetration; the treatment of mine timbers with a combination of water, rock salt and cement; and the application of triolite paste to poles through the use of a bandage of burlap around the base of each pole.

Progress reports on certain special tests of preserving methods relating to termites, fireproofing and marine organisms were presented in three papers, two of which were prepared by George M. Hunt, of the Forest Products Laboratory, and associates, and the third (marine piling) by J. D. MacLean, of the same organization. T. E. Snyder of the Bureau of Entomology, cooperated with Mr. Hunt on the termite study. None of the tests has been completed, but the results obtained to date, which give some indication of what may be expected in the future, were given in considerable detail. Detailed figures relating to the economics of mine timber preservation were presented by A. D. A. Crawford, of Lee, Higginson & Co.

Committee Reports

Of the fourteen committee reports which came before the meeting, the majority simply recorded progress made during the past year without presenting definite conclusions. Six tentative revisions of the association's manual on wood preservation, sponsored by the committee on preservatives, were adopted as standards. Several other revisions were adopted as tentative standards. The committee dealing with the protection of wood against destructive agencies other than decay and marine borers presented a program for extensive research to be carried out in cooperation with the National Lumber Manufacturers Association. Final conclusions on the effect of moisture content on the strength of Douglas fir were presented by a committee on this subject, which recommended that, in view of the fact that timber in use rarely has uniform moisture content throughout its entire section and that under such conditions its strength is affected by a large number of variables, no attempt be made to develop a definite relationship between the two variables mentioned but that test specimens should be subjected to an exposure approximately equal to that obtained in service. The committee on bridge and structural timber submitted a series of recommendations for field procedure in the use of treated timber. Service records for treated ties, poles and posts were added to the record of the association by separate committee reports on the three classifications.

New officers of the association were elected as follows: president, John S. Penney, vice-president, T. J. Moss Tie Co.; vice-presidents, Elmer T. Howson, editor, *Railway Engineering and Maintenance*, and R. S. Belcher, manager treating plants, Atchison, Topeka & Santa Fe Railway. Horace L. Dawson was reelected secretary-treasurer.

Glendale, Ariz., Votes to Sell Municipal Lighting Plant

By vote of 601 to 128, the town of Glendale, Ariz., has accepted the offer of the Central Arizona Light & Power Co., Phoenix, to take over the municipal electric system for a cash price of $287,500. The voters granted the power company a 25-year franchise on condition that the company expend $112,500 in modernizing the system and that rates be made practically the same as in the neighboring city of Phoenix. The vote was taken Jan. 6, payment in full was made Jan. 9, and work was begun Jan. 12.

WASHINGTON NOTES

By PAUL WOOTON
Washington Correspondent

Bill to Maintain Local Wage Rates on Public Work—Allocations Suggested for Federal Buildings

AFTER several years of consideration, the House committee on labor has finally reported out, with its recommendations, the Bacon bill, designed to maintain local wage rates on all construction work undertaken by the federal government. The committee in its report calls attention to the difficulties met with in attempting to maintain local wage scales on public construction work. "Though the officials awarding contracts have faithfully endeavored to persuade contractors to pay local prevailing wage scales, some successful bidders have selfishly imported labor from distant communities and have exploited this labor at wages far below local wage rates," the report states.

The report also calls attention to the fact that the present construction program, which will result in the ultimate expenditure of a half billion dollars, has been undertaken largely to improve the industrial situation in the country. The full benefit of this enlarged building program cannot be realized, the committee feels, if some contractors continue their practice of disrupting local wage scales by importing migratory workmen.

The bill requires that every contract in excess of $5,000 to which the United States or the District of Columbia is a party and which requires or involves the employment of laborers shall contain a provision to the effect that the wage rates shall not be less than the prevailing rate of wages for work of similar nature in the place where the work is to be done. In the event of a dispute as to the prevailing wages in a particular community, the secretary of labor is empowered to determine just what the contractor shall be required to pay.

Allocations for Public Buildings

Suggested allocations for various public building projects out of appropriations already authorized have been submitted to the House by the office of the supervising architect of the treasury. These allocations, which total $68,764,000, will in all probability be incorporated in the second deficiency appropriation bill. The projects include buildings in the District of Columbia, public buildings outside the district and increased appropriations for projects already authorized outside the district. The largest undertaking outside the city of Washington is a new court house in New York, for which a limitation of $8,250,000 is recommended. Other large projects include a new custom house for Philadelphia, $4,200,000; a new court house for Columbus, Ohio, $2,275,000; a new post office for Nashville, Tenn., $1,565,000. For work on the building program in the District of Columbia, $18,099,000 is recommended.

May Defer Reclamation Payments

Dismissal of 2,000 men on various reclamation projects is involved in the item in the first deficiency bill proposing the suspension for a period of five years of the annual payments to the treasury from the reclamation fund. Largely due to the slump in oil royalties, the Bureau of Reclamation will not be able to continue a number of contracts unless it can be relieved of the obligation of the annual payments into the treasury. The suspension of these payments for five years has been approved by the Senate, but the House conferees, at this writing, are insisting upon approval of the item by the Bureau of the Budget, which has not been forthcoming.

Preserving Niagara Falls

As a result of the recent collapse of a small part of the escarpment of Niagara Falls, President Hoover has requested the state and war departments to invite the Dominion of Canada to participate in further joint consideration of measures for preservation of their scenic beauty, in order that, if necessary, proper provision for such plans may be made in the Niagara remedial treaty that is still awaiting ratification by the Senate.

Kentucky Gets Cumberland Falls Area for State Park

A six-year effort to acquire the Cumberland Falls area in Kentucky for a state park has been ended with the announcement by counsel for the Cumberland River Power Development Co. and Attorney General Cammack that the property has been sold to the state for $400,000.

The Business Outlook

Improvement is painfully slow. This is disappointing to those looking for miracles, without understanding how they are produced; but in the longer view the absence this year of a swift rebound from the December bottom is encouraging in a left-handed way. The rise in steel activity is slowing down; but merchandise car loadings suggest increasing movement of finished goods to depleted inventories; building, coal and power production continue to resist further decline; only money turnover, as reflected in bank debits and currency in circulation, has dropped a bit, and the latter has a favorable side, indicating greater public confidence in the banks.

—The Business Week, Feb. 4.

SOCIETY CALENDAR

AMERICAN CONCRETE INSTITUTE, Detroit; annual convention, Milwaukee, Feb. 24-26.

AMERICAN SOCIETY FOR TESTING MATERIALS, Philadelphia; regional meeting, Pittsburgh, March 18.

ENGINEERING INSTITUTE OF CANADA; annual meeting, Montreal, Feb. 4-6.

NATIONAL PAVING BRICK ASSOCIATION, Washington; annual meeting, Pittsburgh, Pa., Feb. 4-6.

NATIONAL RAILWAY ENGINEERING ASSOCIATION, annual convention, Chicago, March 9-12.

ASSOCIATION OF HIGHWAY OFFICIALS OF NORTH ATLANTIC STATES will hold its seventh annual convention in Atlantic City Feb. 18-20. The secretary is A. Lee Grover, Trenton, N. J.

HIGHWAY ENGINEERS ASSOCIATION OF MISSOURI will meet at St. Louis on Feb. 18-20. C. H. Swift is secretary.

KANSAS ENGINEERING SOCIETY met in Topeka, Jan. 22-23. The subjects presented included the following: permeable jetties, C. R. Van Orman; river hydraulics, George S. Knapp; elastic properties of concrete, Philip M. Noble; pipe line work, S. S. Learned and F. A. Graham; wind stresses in building, A. M. Meyers; old bridges and their carrying capacity, F. W. Epps. Officers elected were: president, J. M. Mazity, Newton; vice-president, L. K. White, Wichita; secretary-treasurer, Murray Wilson, Pratt.

KANSAS WATER WORKS ASSOCIATION will hold its sixth annual meeting at the University of Kansas, Lawrence, Feb. 11-13. On the same days will be held the ninth annual three-day school conducted by the university school of engineering and architecture in cooperation with the state board of health, for municipal officials and employees who have to do with the operation and maintenance of water-works systems, water-purification plants, sewers and sewage-disposal works.

LOUISIANA ENGINEERING SOCIETY, at its meeting on Jan. 24, elected officers as follows: president, Frank G. Frost; vice-president, Fred N. Billingsley; secretary, Frank A. Muth; treasurer, Walter B. Moses.

OHIO ENGINEERING SOCIETY at its annual meeting in Columbus Jan. 21-22 considered surveyors' problems and the registration of engineers. The duties of a modern county surveyor were outlined by Clyde R. Zeune, and the cooperation of surveyors in protecting benchmarks of the U. S. Geological Survey was discussed by Prof. E. F. Coddington, Ohio State University. The proposed registration bill was presented by C. C. Lattimer, while Canadian registration practice was discussed by Prof. O. J. Marshall. Ralph G. Taylor was elected president and John Laylin, Columbus, Ohio, was reelected secretary.

OKLAHOMA WATER AND SEWAGE CONFERENCE will be held at the Oklahoma A. & M. College, Stillwater, April 19 to 24.

PROVIDENCE ENGINEERING SOCIETY, Municipal Section, at its meeting on Feb. 20 will hear John V. Keily, materials engineer, state board of public roads, on "Method Used in Selection of Suitable Concrete and Road-Building Materials and Review of Latest Methods for Testing Soils."

SEATTLE CHAPTER, Associated General Contractors of America, has chosen the following officers for the ensuing year: president, James Murdock; vice-president, George E. Tuefel; secretary, O. J. Gregg; treasurer, A. S. Downey.

TEXAS SECTION, Southwest Water Works Association, meeting in Waco Jan. 21-23, elected the following officers: president, L. A. Grimes, Abilene (reelected); vice-presidents, J. D. Rogers, Port Arthur; Clyde C. Hays, Waco; C. M. Crawford, Childress; E. P. Schoch, Austin; secretary, V. M. Ehlers, Austin; treasurer, E. G. Eggert, Austin. The 1932 meeting of the association will be held in Mineral Wells.

TRAFFIC CLUB OF PITTSBURGH will hold its annual dinner on March 5 in the William Penn Hotel.

Personal Notes

FREDERICK ESSIG, Tacoma, Wash., has been named chief engineer of the intercounty river improvement district board, which will direct a $150,000 flood-control program in the Stuck River Valley during 1931. ERNEST B. HUSSEY, Seattle, will be consulting engineer.

ROBERT LEE WILSON, assistant to the president of the Westinghouse Electric & Mfg. Co., has resigned and will devote himself mainly to his private affairs. He will, however, be retained by the Westinghouse company on call in a consulting capacity.

V. L. PETERSON, engineer for the Tacoma (Wash.) public utilities extension division for the past four years, has resigned to accept a position with the U. S. army in connection with barracks construction at Fort Shafter, near Honolulu.

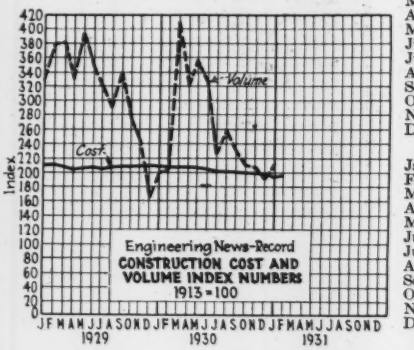
CHARLES A. GILL, superintendent of motive power for the Baltimore & Ohio Railroad, has been given a leave of absence, and will serve during the next year as chief consulting engineer for the railroad system of Russia. Most of his work in Russia will be in an advisory capacity and will cover reconstruction of power systems and planning new roundhouses, engine terminals and shops.

H. G. DALTON, formerly assistant engineer of buildings, Chicago, Burlington & Quincy Railroad, has been appointed engineer of buildings, succeeding W. T. Krausch, recently deceased. Mr. Dalton has been in the building department of the Burlington for the past 25 years.

H. P. CHAPMAN, Columbus, has been appointed assistant director of highways of Ohio. Mr. Chapman has been chief construction engineer during the past two years. ELMER HILTY, Lima, has been named chief engineer of construction, to fill the vacancy caused by the promotion of Mr. Chapman. Mr. Hilty was surveyor of Hancock County for two years and for several years was resident engineer of the Chicago & South Bend Traction Co.

Construction Cost and Volume Index Numbers

Costs increased 1 per cent during January, the first increase since April; but are 4.7 per cent below those of a year ago. The volume index shows an increase of 8.3 per cent over December and 4.5 per cent over January, 1930.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Volume
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Engineering News-Record
CONSTRUCTION COST AND VOLUME INDEX NUMBERS
1913 = 100
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1929
1930
1931

E.N.-R. Cost		E. N.-R. Volume*	
Feb., 1931	**196.61**	**Jan., 1931**	**208**
Jan., 1931	194.48	Dec., 1930	192
Feb., 1930	206.46	Jan., 1930	199
1930 (average)	202.85	1930 (average)	260
1929 (average)	207.02	1929 (average)	317
1913 (average)	100.00		
1929		1929	
January	209.40	January	325
February	210.40	February	378
March	207.78	March	382
April	203.40	April	332
May	205.15	May	395
June	205.65	June	347
July	204.77	July	320
August	205.91	August	290
September	207.57	September	340
October	206.32	October	273
November	208.46	November	245
December	209.46	December	166
1930		1930	
January	208.96	January	199
February	206.46	February	204
March	206.80	March	408
April	207.12	April	320
May	205.86	May	354
June	203.36	June	324
July	200.95	July	226
August	200.95	August	259
September	199.58	September	232
October	198.72	October	211
November	198.54	November	207
December	196.86	December	192

*Corrected for price change since 1913.

Obituary

FRANK M. WESTCOTT, commissioner of parks of Syracuse, N. Y., died on Jan. 31 from a heart attack. Mr. Westcott had been connected with the street and park departments for 29 years, joining the city street department in 1902. He was 68 years old.

LUIGI LUIGGI, one of the leading engineers of Italy, died of apoplexy in Rome on Feb. 1. Dr. Luiggi was professor of hydraulic and maritime engineering at the Royal University of Rome, inspector general of the Royal Corps of Civil Engineers, a director of the State Railways of Italy and a member of Parliament from Genoa, in which city he was born in 1856. From 1882 to 1892 Dr. Luiggi had charge of the construction of the breakwaters in the harbor of Genoa. From 1896 to 1905, as consulting engineer to the Argentine government, he carried out extensive construction at a cost of $15,000,000 at the naval dockyard of Bahia Blanca. He also built a complete system of lighthouses and semaphore stations along the coast from Bahia Blanca to the southern extremity of South America. Since 1913 he had been a member of the international advisory board for the Suez Canal. In 1921 Dr. Luiggi was made an honorary member of the American Society of Civil Engineers.

HENRY D. WINTON, who had been associated for more than 45 years with the Hersey Manufacturing Co., maker of water meters, died at his home in Wellesley Hills, Mass., on Jan. 23, in his 75th year. Mr. Winton was born in Meriden, Conn., and had made his home in Wellesley Hills for more than 50 years. After he was graduated from the Massachusetts Institute of Technology, he entered the railway signal field, where his inventive ability was quickly demonstrated. In 1885 he became associated with the Hersey company and at the time of his death was its secretary as well as a member of the board of directors. His many inventions and his knowledge of the art made him a dean of that group of men who have done much to place the water meter industry on a sound basis.

ENGINEERING CONSTRUCTION CONTRACTS REPORTED IN 1930

Thousands of Dollars (000 omitted)

	New England	Middle Atlantic	South	Middle West	West of Mississippi	Far West	U. S., 12 months 1930	U. S., 12 months 1929	Canada, 12 mos. 1930
Water-works	$3,031	$11,740	$3,764	$11,001	$9,682	$9,340	$48,558	$48,617	$8,601
Sewers	4,787	18,865	7,689	33,676	10,691	6,481	82,189	87,674	7,254
Bridges, public	4,160	40,292	14,739	17,643	23,852	8,704	109,390	97,992	8,558
Excavation	1,534	1,463	10,945	7,432	8,452	4,550	34,376	31,570	7,629
Streets and roads	29,573	148,869	99,558	107,075	129,038	62,880	576,993	539,352	20,652
Federal government	5,212	32,913	26,708	11,515	27,819	12,278	116,445	103,901	.....
Unclassified, public	4,386	91,706	2,667	9,562	10,105	5,126	123,552	131,685	27,819
Buildings, public	45,525	108,265	16,103	76,210	26,752	24,864	297,719	305,702	18,558
Total public	98,208	454,113	182,173	274,114	246,391	134,223	1,389,222	1,346,493	99,071
Buildings, industrial	27,189	99,198	22,965	81,743	36,618	63,458	331,171	547,313	39,021
Buildings, commercial	109,583	570,607	30,406	120,960	99,203	102,913	1,033,672	1,670,285	31,845
Bridges, private	4,225	5,521	750	3,184	5,853	650	20,183	37,596	208
Unclassified, private	26,049	158,809	33,923	53,732	101,949	24,549	399,011	348,628	17,561
Total private	167,046	834,135	88,044	259,619	243,623	191,570	1,784,037	2,603,822	88,635
Twelve months, 1930	265,254	1,288,248	270,217	533,733	490,014	325,793	3,173,259	.....	187,706
Twelve months, 1929	237,938	1,680,502	329,984	747,032	583,487	371,372	.....	3,950,315	189,248

CONSTRUCTION NEWS

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Some of the Week's Large Projects

For further details turn to the appropriate sections in this issue.

Location	*Project*	*Cost*	*Status*
Bridges			
Portsmouth (N. H.)	Bridge	$1,500,000	Proposed
Federal Government			
Washington	Dept. Labor building	6,500,000	Proposed
Washington	Interstate Commerce building	6,500,000	Proposed
Paris (France)	Embassy	1,500,000	Proposed
Foreign			
India	Assembly plants	1,000,000	Proposed
Yugoslavia	Power plant, etc.	1,000,000	Proposed
Grain Elevators			
Kansas City	Grain elevator	1,500,000	Bids asked
Parks and Sports			
Toronto (Ont.)	Sports arena	1,500,000	Proposed
Pipe Lines			
Texas, Arizona and Mexico	Gas pipe line	6,000,000	Contracts
Railways			
Indiana	Switch yard, etc.	10,000,000	Day labor and separate contracts
Waterworks			
Wichita Falls	Reservoir, etc.	1,000,000	Bids asked
Unclassified			
Indianapolis	Telephone lines, etc.	2,591,000	Proposed
Industrial Buildings			
Ojibway (Ont.)	Steel plant	60,000,000	Proposed
Montreal	Garage	1,500,000	Proposed
Schenectady	Steam power plant	4,000,000	Day labor
Commercial Buildings			
Des Moines (Iowa)	Bank	1,500,000	Contract
Indianapolis	Hospital	1,000,000	Proposed
St. Louis	Hospital	1,500,000	Proposed
Bronxville (N. Y.)	Residential	1,500,000	Separate contracts
Atlantic City	Residential	6,000,000	Contract
Rochester	Divinity school	1,000,000	Bids asked
Cleveland	University	2,500,000	Proposed

AIRPORTS

PROPOSED WORK

Calif., Burbank — United Airport Co., new hangar for airport, near here. To exceed $50,000.

Calif., Sacramento — City Council plans by Starks & Flanders, Forum Bldg., wood, steel hangar. $65,000.

Fla., Lake Wales—City, c/o Mayor, airport, steel, brick walls. Architect not selected.

BOND ELECTIONS

COMING BOND ELECTIONS

Harbor Impvts.—National City, Calif., $40,000.

Irrigation—Yuma, Ariz., Municipal Water Conservation Dist., A. B. Ming, Secy., $328,000.

Sewers — Los Angeles, Calif., May or June, $6,000,000.

Sewers—Slidell, La., Feb. 10, $40,000.

Filtration Plant Impvts. — Sacramento, Calif., Mar. 10, $480,000.

Reservoir, Deep Well, etc. — Upland, Calif., $45,000.

Waterworks Ext.—Ponca City, Okla., Feb. 6, $36,000.

Waterworks Impvts.—Shawnee, Okla., $225,000.

Schools—Saticoy, Calif., School Dist., $150,000.

Junior High School — Decatur, Ill., Feb. 15, $150,000.

Light and Power Plant — Fairfax, Okla., Feb. 24, $120,000.

BONDS VOTED

Transmission Lines—Case Grande, Ariz., Electric Dist. 3, c/o F. T. Rainey, Secy., $296,000.

Water Distribution System, etc.—Milbrae, Calif., $15,000.

Waterworks Ext.—Chickasha, Okla., R. O. Bradley, Engr., $193,000.

High School—Rock Springs, Wyo., $350,000.

BONDS DEFEATED

Flood Prevention — El Paso County, Tex., $150,000.

Court House — Chadron, Neb., Dawes County, (postponed), $200,000.

Hospital — El Paso City and County, Tex., $550,000.

Fla., Miami—International Aeronautical Industries, H. L. Pierce, trustee and vice pres., and affiliated organizations, All-American Airways, Inc., Safety Aircraft Corp. and Miami Motor Glider Corp., all in Miami, plans by C. P. Nieder, A. I. A., 321 Calumet Bldg., constructing within next few weeks small hangar, and in near future main building 2 or more story, 550 ft. long, with 2 wings each 650 ft. or total spread of 1,900 lin.ft., aviation schools, airplane factory, machine shops. $650,000 for main building.

CONTRACTS AWARDED

Mass., Norwood-Dedham-Canton — Massachusetts Air Terminal & Arena, H. E. Shaw, H. W. Plimpton, Norwood, grading for airport, Fisher Meadows off Neponset St., to J. F. White Contr. Co., 56 Ellery St., Cambridge. Est. $50,000. Noted Jan. 22.

Okla., Oklahoma City—See "Waterworks."

BRIDGES

PROPOSED WORK

California—State Hy. Comn., Sacramento, 81 ft. rein.-con. girder bridge over San Francisquito Creek, San Mateo Co.—100 ft. rein.-con. arch bridge over Gaviota Creek, Santa Barbara Co.—140 ft. rein.-con. bridge across Carnadero Creek, Santa Clara Co.—185 ft. rein.-con. overhead crossing at Essex, San Bernardino Co.—175 ft. steel bridge with concrete deck over Lytle Creek, San Bernardino Co. C. H. Purcell, hy. engr.

Calif., Oakdale — Stanislaus Co. (Modesto) bridge over Stanislaus River. To exceed $25,000. G. Macomber, Modesto co. surv.

Ind., Goshen—Bd. Comrs. Elkhart Co., bridge over Elkhart River. $70,000. F. Mishler, Goshen, aud.

Kentucky and Ohio—A bill has been introduced to permit Dixie Bridge Co., Covington, Ky., to construct "Y" shaped bridge over Ohio and Licking Rivers, connecting Covington and Newport, Ky., and Cincinnati, O. $4,000,000. J. R. Biedinger, Covington, Ky., engr.

Maine — Maine Central R.R., 222 St. John St., Portland, strengthening, reconstructing bridge over Stickey River at Sebago, $25,000; constructing steel, concrete bridge over New Meadow River at Bath, to exceed $25,000. A. H. Morrill, 222 St. John St., Portland, engr.

Md., Baltimore—Public Impvt. Comn., allocated $500,000, for construction 400 ft. steel, rein.-con. bridge over Colgate Creek to carry Browning Hy. over creek. J. E. Greiner, Lexington Bldg., designing and consult. engr.

Massachusetts — Commonwealth of Massachusetts, Dpt. P. Wks., State House, Boston, bridge between Boston and Hull, Boston Harbor. To exceed $25,000. A. W. Dean, Dpt. P. Wks., Boston, engr.

Mass., Boston — City, Dpt. P. Wks., preliminary plans rein.-con., steel hy. bridge over

See proposal advertising on page 149

LEADITE

—used in practically every civilized portion of the world—*with success*

LEADITE, in use for more than a Quarter Century, — is the "PIONEER" self-caulking material for jointing bell and spigot pipe. The wide-spread use of LEADITE, plus the enviable reputation it has made for itself, is significant of its widely known and accepted Efficiency and Economy.

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The pioneer self-caulking material for c. i. pipe.
Tested and used for over 30 years.
Saves at least 75%.

THE LEADITE COMPANY
Land Title Building - - Philadelphia, Pa.

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Bridges (Continued)

Boston & Albany R.R., on Albany St., $40,000; rein.-con., steel, hy. bridge over New York, New Haven & Hartford R.R., Shawmut Ave., $75,000. J. E. Carty, City Hall, engr.

Mass., Medford (br. Boston)—Commonwealth of Massachusetts, Metropolitan Dist. Comn., Boston, bridge over Mystic River and Parkway from Revere Beach and Fellsway to Mystic Ave. $400,000.

Mass., Ware—Town, Bd. Selectmen, 2 rein.-con. bridges, Palmer Rd. and Vernon St. $25,000 or more.

Minn., Minneapolis—City steel, concrete bridge over Mississippi River, at 34th or 38th St. $750,000. N. W. Elsberg, city engr.

Neb., Omaha—Leavenworth Viaduct Assn., bridge, Leavenworth St., from 10th to 15th Sts. $400,000. F. Rice, Bankers Reserve Life Bldg., engr.

Neb., Omaha — C. B. Moriarty, et al., 700 Peters Trust Bldg., bridge to have seven 400 ft. steel truss spans, 1,900 ft. steel viaduct approaches, earthfill over Missouri River at 13th St., South Omaha, also 6 mi. paving on Iowa side of River. Ash, Howard, Needles & Tammen, 1012 Baltimore Ave., Kansas City, engrs. Noted Jan. 29.

Nev., Lovelock—State Hy. Comn., Carson City, 4 span, 175 ft. concrete, steel bridge, Pershing Co., near here. $50,000. S. C. Durkee, state hy. engr.

N. H., Portsmouth—Boston & Maine R.R. Co., W. J. Backes, ch. engr., Boston, Mass., concrete steel bridge over Piscataqua River. $1,500,000.

New Jersey—Bd. Freeholders Ocean Co., Court House, Toms River, steel, creosote timber bascule bridge over Barnegat Bay, between Mantoloking and West Mantoloking. $200,000. Project in abeyance. H. C. Shinn, Municipal Bldg., co. engr. Noted July 17.

N. J., Elizabeth—Bd. Freeholders Union Co., Court House, steel, concrete bridge over Elizabeth River, at Summer St. $25,000 or more. Project in abeyance. Noted Dec. 25.

N. J., New Brunswick—Bd. City Comrs., City Hall, preliminary plans 300 ft. steel, concrete bridge over Weston's Mill Pond, $25,000 or more. A. Atkinson, city engr.

N. J., Rahway—Bd. Freeholders Union Co. Court House, Elizabeth, sketches steel, concrete bridge over Rahway River, Meadow St. $25,000. R. Collins, Elizabeth, co. engr.

N. J., Trenton—Bd. Freeholders Mercer Co., Court House, replacing Chambers Street Bridge over Pennsylvania R.R. $25,000. H. F. Harris, Court House, co. engr. Noted Jan. 9.

N. Y., Buffalo—Soon takes bids repairing, strengthening, paving Elk-Abbott Viaduct, Michigan Ave., Seneca St. and Hamburg St. Viaducts. Reidpath & Wilson, 1023 Gerrans Bldg., engrs.

Oklahoma—State Hy. Dpt., Oklahoma City, preliminary plans 7 span 100 ft. rein.-con. bridge at Cushing, Payne Co., $25,000; 3 span 170 ft. steel truss and I-beam bridge on concrete piers at Agra, Lincoln Co., $30,000. A. E. Losh, hy. engr.

Oklahoma—State Hy. Dpt., Oklahoma City, preliminary plans 8 span 128 ft., rein.-con. trestle bridge at Hollis, Harmon Co. $30,000; 7 span 114 ft. rein.-con. trestle bridge at Snyder, Kiowa Co. $27,000. A. R. Losh, hy. engr.

Okla., Watonga—State Hy. Dpt., Oklahoma City, preliminary plans 9 span 120 ft. rein.-con. trestle, Blaine Co. $27,000. A. R. Losh, hy. engr.

Tenn., Memphis—City, W. Overman, mayor, State Dpt. Hys. & P. Wks., Nashville, R. H. Baker, comr., Louisville & Nashville R.R. Co., Louisville, Ky., W. H. Courtenay, ch. engr., and Union Ry. Co., Union Station, 2,400 ft. concrete, steel viaduct, 36 ft. roadway, 7½ ft. sidewalks, on Summer Ave. $325,000.

Texas—Tom Green Co. (San Angelo), c/o A. F. Jones, judge, San Angelo, 2 bridges, 1 over South Concho River at Christoval, other over Kickapoo Creek, southwest of San Angelo. E. Beavers, San Angelo, co. engr. Noted Oct. 30, under "Christoval."

Utah, Greenriver—Denver & Rio Grande Western R.R. Co., A. O. Ridgway, ch. engr., Equitable Bldg., Denver, Colo., preliminary plans steel, concrete bridge over Green River. $150,000.

Que., Dosquet — Municipal Council and Lotbiniere Co. (Ste-Croix), A. P. Poulin, secy. treas., soon let contract concrete slab and girder bridge. $25,000.

BIDS ASKED

D. C., Wash.—Mar. 2, by District Comrs., District Bldg., removing existing bridge, constructing steel arch, stone faced, rein.-con. abutment bridge, across Klingle Valley, in line Connecticut Ave. $250,000. Noted Dec. 25.

Kan., Wellington — Feb. 9, at office J. A. Alexander, clk. Sumner Co., Bridge 1, three 100 ft. steel trusses, with 20 ft. roadway, incl. 37,518 lb. reinforcing and 274,690 lb. structural steel, 1,600 lin.ft. piling, S-6 Rd., Project FF-5-E-1.

Kentucky—Feb. 18, by State Hy. Dpt., Frankfort, bridge to have one 161 ft. and two 126 ft. steel truss spans, one 60 ft. steel I-Beam span with concrete floor on concrete piers, abutments over Clarks River, on Paducah-Smithland Rd., Federal Aid Project 207-AB, McCracken Co. B. Johnson, chn.

Md., Baltimore — Feb. 11, by Bd. Awards, Mayor and City Council, City Hall, 585 ft. steel, concrete bridge, incl. four 60 ft. steel deck girder spans, 20 ft. rein.-con. roadway, pipe railing over Gunpowder Falls at Prettyboy Dam. N. L. Smith, Municipal Bldg., hy. engr.

Mississippi — Feb. 11, by State Hy. Comn., Jackson, 4 concrete bridges on Hickory-Chunky Rd., Federal Aid Project 6, Newton Co., incl. 1,236 cu.yd. concrete, 235,755 lb. reinforcing steel, 844 lin.ft. concrete railing, C. R. Williamson, dir.

Mississippi—See "Streets and Roads."

New Jersey—Feb. 16, by State Hy. Comn., Trenton, 2 bridges on Route 4, Sect. 3, over Grand and Broad Aves., Bergen Co. A. L. Grover, ch. engr.; adv. E. N.-R. Feb. 5.

New Jersey and Pennsylvania—Feb. 11, by L. Focht, engr., State Office Bldg., Trenton, N. J., replacing 4 timber spans with 4 steel spans, strengthening 2 steel spans on bridge over Delaware River between Uhlertown, Bucks Co., Pa., and Frenchtown, Hunterdon Co., N. J., for Joint Comn. for Eliminating Toll Bridges over Delaware River. $100,000. Noted Jan. 1.

New York and New Jersey—Mar. 2, at office General Manager Port of New York Authority, 80-90 8th Ave., New York, paving, railings, miscellaneous construction for main bridge and New York anchorage of Hudson River Bridge between Fort Washington, N. Y., and Fort Lee, N. J.; adv. E. N.-R. Feb. 5.

N. Y., Buffalo—Feb. 10, by W. G. Hickman, 20 County Hall, 30 x 40 ft. I-beam bridge on North Millgrove Rd. C. R. 268, Alden—20 x 24 ft. concrete slab bridge, on Pratham Rd., C. R. 407, Sardinia—twin span concrete arch 189 x 24 ft. over Buffalo Creek, on Lein Rd., C. R. 154, West Seneca.

North Carolina—Feb. 10, by State Hy. Comn., Raleigh, rein.-con. bridges, culverts on Project 7420, Yadkin River Jct., Route 60, Forsyth Co., $74,300—bridge over Cape Fear, on Project 4363, at Gillington, Harnett Co., J. D. Waldrop, Raleigh, engr.

R. I., Providence—Feb. 9, by Bd. Contr. & Supply, abutments for concrete bridge, Eagle St. and Quinsley Ave. $25,000. Noted Jan. 22.

Tennessee—See "Streets and Roads."

Wash., Bellingham — Comrs. Whatcom Co., bids about Feb. 26, redecking Wiser Lake Bridge. $45,000. C. McCoy, Bellingham, co. engr.

Wisconsin—Feb. 12, by State and Rock Co. Hy. Comns., State Capitol Annex, Madison, constructing Turtle Creek Bridge Overhead, approaches, S. T. H. 14, S.A.P. 1298.

Wisconsin—Feb. 12, by State Hy. Comn., Capitol Annex, Madison, constructing Main Channel Spring Green Bridge over Wisconsin River, S. T. H. 11-2, Sauk and Iowa Counties—Portage Bridge on S.T.H. 33-81, Portage, Columbia Co.—Red Cedar Bridge, U. S. Hy. 10-12, S.T.H. 25 and 64, Menominee, Dunn Co.—McGilvery Bridge (main Channel Black River) S.T.H. 167, LaCross and Trempealeau Counties—Boscobel Slough Bridge, S.T.H. 27, Boscobel, Grant Co. W. C. Buetow, state hy. engr.

Ont., Cobalt—Feb. 14, by C. H. Fullerton, deputy minister Dpt. Northern Development, Parliament Bldgs., Toronto, structural steel in connection with one 80 ft. and ten 30 ft. span overhead bridge on concrete abutments, piers over T. & N. O. Ry. and Nepessing Central Ry., Lang St., $75,000. Balance of work will probably be done by day labor.

Que., Victoriaville—Feb. 10, by W. Fortier, town secy. and treas., concrete bridge over Nicolet River. $45,000. Z. Langlais, 105 Mountain Hill, Quebec, engr.

CONTRACTS AWARDED

Idaho — R. H. Shoemaker, acting comr. P. Wks., Boise, bridge over Boise River, on Capitol Blvd., to Morrison-Knudsen Co., Boise, $84,396. Est. $117,105. Noted Jan. 22.

Idaho, Challis—State Dpt. P. Wks., Bureau Hys., Boise, bridge to have two 410 ft. steel spans on concrete pier and abutments over Salmon River, near here, Custer Co., to D. J. Cavanagh, Twin Falls, $39,540.

Iowa—State Hy. Comn., Ames, bridges, culverts in Mills Co., to Wilson Constr. Co., Red Oak, $15,375—Kossuth Co., to Hildebrand & Kragh, Belmond, $5,582—Mahaska Co., to Ward & Taylor Constr. Co., Decorah, $56,035 — Muscatine Co., to Snyder & Johnson, Humboldt, $16,522—culverts in Emmet Co., to Milford Constr. Co., Milford, $12,616. Grand total $106,130. Noted Jan. 15.

Kansas—State Hy. Comn., Court House, Lawrence, bridges in Douglas Co., to Luttjohann Bros., Topeka, $15,373—to Reed & Wheelock, Clay Center, $4,033—and to Wayland Bros. Co., Washington, $10,799. Grand total, $30,205. Awarded about Dec. 31.

Kentucky—See "Streets and Roads."

Maryland — State Roads Comn., Baltimore, superstructure, structural steel girder bridge over Pennsylvania R.R. at Bare Hills, Contr. B-175-43, Baltimore Co., to Phoenix Bridge Co., Phoenixville, $11,003. Noted Dec. 18.

Michigan — H. G. Rose, div. bridge engr., Grand Rapids, M X I of 11-18-1, Contr. 2, 3 rein.-con. T-beam spans, concrete floors, wearing surface, two 6 ft. sidewalks, Berrin Co., to Bridges & Davies, Escanaba, $26,013.

Michigan—At office A. L. Burridge, div. engr., Cadillac, F.A.Br. 1 of 51-7-6, 2 rein.-con. abutment, steel deck girder, Manistee Co., Contr. 1, structural steel, to McClintic-Marshall Co., 1242 Book Bldg., Detroit, $10,675; Contr. 2, incl. cement and aggregates, to J. R. Edelman Co., Muskegon, $65,877, for State Hy. Comn., Lansing. Noted Jan. 1.

Minnesota—A. P. Erickson, aud. Hennepin Co., Minneapolis, constructing steel bridge, straightening old approaches over Crow River, Hennepin Co. Rd. 8, for Hennepin Co. (Minneapolis) and Wright Co. (Buffalo), to Bland Eng. Co., 459 Northeast L St., Minneapolis, $32,000. Noted Dec. 4.

Montana—State Hy. Comn., Helena, bridge, Richland Co., to Portland Bridge Co., Yeon Bldg., Portland, Ore., $288,985 — timber pile trestles, Roosevelt Co., to Rue Bros., Inc., Bismarck, N. D., $22,319 — treated timber trestles, Carbon Co., to Elliott & Neabitt, Sandpoint, Idaho, $12,354—bridges, Beaverhead Co., to B. H. Cranshaw, Livingston, $4,610. Grand total $328,268. Noted Jan. 19.

New York—W. G. Hickman, comr., Erie Co., bridges on Casey Rd., Amherst and on Bordon Rd., Cheektowaga to L. K. Kahle, 2364 Genesee St., Cheektowaga, $4,800 and $5,600 respectively—on Larkin Rd., Clarence, to D. W. Brown & Co., 3000 Delaware Ave., Kenmore, $2,495—on Heise Rd., Clarence, to J. A. Hartwig, Clarence, $4,900—on C. R. 461, East Hamburg, to Holmes & Murphy, Orchard Park, $3,445. Grand total $21,240. Noted Jan. 14 Daily.

Ore., Portland—Multnomah Co., general contract approaches and decks Hawthorne Ave. Bridge over Willamette River, to Lindstrom & Feigenson, Worcester Bldg., $87,417. Noted Dec. 4.

Pennsylvania — State Hy. Dpt., Harrisburg, fabricating, erecting 134 ft. 10 in. deck truss span, 91 ft. 7½ in. through plate girder span bridge on concrete piers, abutments, 23 ft. roadway, Valley and East Wheatfield Twps., Indiana Co., to Welsh Constr. Co., 2331 Los Angeles Ave., Pittsburgh, $101,189. Noted Dec. 4, under "Streets and Roads."

Tex., Houston—City, W. E. Monteith, mayor, rein.-con. bridge over Brays Bayou, on Telephone Rd., to B. P. Panas, Esperson Bldg., $41,500, Est. $50,000. Noted Dec. 19.

Virginia—State Hy. Dpt., Richmond, bridges over Muddy Creek, Stafford and King George Counties, to Boatwright, Russell & Linton, Manassas, $10,987—over Dragon Run River, Gloucester and Middlesex Counties, to Tunstall-Johnson Co., Norfolk, $15,087—over Four-Mile Run River, Arlington Co., to Northern Virginia Constr. Co., Clarendon, $4,293—over Hampton Hall Creek, Northumberland and Westmoreland Counties, to J. S. Bowers, Whiteville, N. C., $9,636. Grand total $40,103. Noted Jan. 15, under "Streets and Roads."

Ont., Toronto — Toronto and York Roads Comn., 57 Adelaide St. E., superstructure 800 ft. rein.-con. bridge on Woodbine Ave., East York, to R. H. McGregor Constr. Co., 79 Adelaide St. E. Est. $300,000. Contract for substructure, previously reported awarded to Rayner Constr. Co., Ltd., 159 Bay St. Noted Oct. 23.

EQUIPMENT

PROPOSED WORK

MOTOR TRUCKS—San Jose, Calif.—City purchasing four 1.5 tons trucks for Street Dpt.

MOTOR TRUCK—Santa Ana, Calif.—Purchasing Agent Orange Co. purchasing 3 ton motor truck for Road Dept.

MOTOR TRUCKS — Stockton, Calif. — City purchasing two 1.5 ton motor trucks for Street Dpt.

TRUCKS—Crookston, Minn.—Polk Co. bids in summer or fall one or more 3½ to 5 ton trucks. Former bids rejected. H. J. Welte, co. aud.

CATERPILLAR TRACTOR—Chester, Mont.—Liberty Co., J. M. Burke, surv., purchasing 1 caterpillar tractor.

GRADER—Fort Benton, Mont.—Chouteau Co., H. M. Hansen, clk., purchasing elevated grader.

TRUCK—Huron, S. D.—Beadle Co., E. Curtis, aud., purchasing 1 truck and 1 motor patrol. H. W. Pierce, Huron, co. engr.

MOTOR PATROL—Mitchell, S. D.—Davison Co., D. Stebbins, aud., purchasing motor patrol. D. I. McLeod, Mitchell, co. engr.

TRANSFORMERS—Seattle, Wash.—Bd. P. Wks., twenty-four 100 kva. and thirty-six 150 kva. single phase, 60 cycle, 4330/125/250 volt submersible subway transformers, 252 cable external reactors, rated at 1,200 ampere 60 cycle, 1.44 kva. 1.2 volts.

BIDS ASKED

TRUCK—Los Banos, Calif.—Feb. 18, by V. G. Bryant, city clk., pick-up truck fully equipped for use in Municipal Water Dpt.

GAS TANKS—Ukiah, Calif.—Feb. 18, by F. L. Bosworth, city clk., 2,500 cu.ft. riveted gas tanks, 6 ft. diam. x 30 ft. long, ⅜ in. shell, ¼ and ⅜ in. heads.

DERRICK—East Cambridge (mail Boston), **Mass.**—John Harrington Co., 52 1st St., in market stiff leg derrick, about 35 ft. mast, 50 ft. boom, 15 ton capacity, with bull wheel and double drum skeleton hoisting engine with turning winch.

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Equipment (Continued)

GRADER BLADES—St. Paul, Minn.—Feb. 18, by State Hy. Dpt., 1246 University Ave., St. Paul, grader blades for 1931 season.

TRACTOR and GRADER—Tecumseh, Okla.—City, R. W. Calloway, mgr., in market 30 hp. caterpillar tractor and 1 road grader, for Street Dpt.

EXCAVATION, DRAINAGE, IRRIGATION, LEVEES, RIVER AND HARBOR

PROPOSED WORK

Mass., South Hadley — Town, T. R. Quirk, chn., 140 ft. rip rap dike on Connecticut River to guard against high water floods. $50,000. Seeking state aid for project. Engineer not selected.

Minn., St. Paul — American Agricultural Chemical Co., 420 Lexington Ave., waterfront development and fertilizer manufacturing. To exceed $150,000. **Maturity indefinite.**

N. J., Spring Lake — Boro repairing jetties. $19,000. E. H. Schmeider, Spring Lake, engr.

Tex., Corpus Christi—Aransas Harbor Corp., completed plans and made application for permission to construct 1,250 ft. bulkhead along north side Corpus Christi channel on Harbor Island, incl. 250 ft. wharf, 20 ft. wide alongside bulkhead, dredging area in front of bulkhead to depth of 33 ft. $100,000. Private plans.

Wash., Seattle—City appropriated $100,000, diking, deepening Lake Youngs. Noted Sept. 4.

Wash., Seattle—Inter-County Impvt. Bd., for King Co. (Seattle) and Pierce Co. (Tacoma) river improvements, flood control in Stuck River Valley. E. B. Hussey, Alaska Bldg., Seattle, consult. engr.

Ont., Stratford — Twps. of Ellice, Fullarton and Logan, cleaning out, improving Whirl Creek Municipal Drain. $25,000. F. W. Farncombe, Richmond Bldg., London, engr.

BIDS ASKED

N. J., Trenton—Feb. 27, by Bd. City Comrs., City Hall, 1,200 lin.ft. bulkhead, dredging 50,000 cu.yd. and making 8,500 cu.yd. Cobble Back Fill for Municipal Terminal. L. D. Hirsch, city clk.; adv. E. N.-R. Feb. 5. Noted Jan. 29.

Ont., Ottawa — Secretary Bd. Control bids about Mar. 1, flood prevention work on Rideau River, $100,000. A. F. Macallum, City Hall, engr.

Que., St. Hyacinthe—See "Contracts Awarded."

CONTRACTS AWARDED

Ia., Cedar Rapids—For 369 ft. rein.-con. retaining wall on east bank Cedar River, 1st to 3rd Aves., S. E., incl. 7,700 cu.yd. excav., 7,000 ft. piling, to Wickham Bridge & Pipe Co., 1905 West Bway., Council Bluffs, $65,267. Est. $86,500. Noted Sept. 18.

N. J., Atlantic City—Atlantic Co., Guarantee Trust Bldg., creosoted timber bulkhead at westerly point Bridge A-C or Brigatine Bridge, to D. S. Bader Constr. Co., Virginia St. Est. $25,000.

Que., St. Hyacinthe—City, City Hall, 610 ft. rein.-con. retaining wall, 16 ft. high, on Yamaska River, Girouard St., (1 section 150 ft. long, completed), building 4 timber cofferdams (3 already constructed), rebuilding 95 ft. 18 in. clay sewer, for park development, day labor under supervision of A. E. Bourbeau, city engr. $35,000.

FEDERAL GOVERNMENT

PROPOSED WORK

Ala., Montgomery—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, Lee, Church and Court Sts.

D. C., Wash.—OFFICE—Treas. Dpt. at office Sup. Archt., plans A. Brown, Jr., 261 Kearny St., San Francisco, Department of Labor Building, 6 story, steel, concrete, $6,500,000; Interstate Commerce Building, 6 story, $6,500,000, both in the Triangle. Noted Aug. 2, 1928.

Idaho, Strevell—AIRWAYS RADIO PLANT—U. S. Dpt. Commerce, Salt Lake City, Utah, new buildings, incl. office, residence, emergency field runway, at U. S. Radio Plant.

Ind., Fort Benjamin Harrison—HOSPITAL—Con. Q.M. 3 story military hospital with 40x100 ft. and 50x80 ft. wings, all steel, brick. H. A. Green, supt.

Ind., Linton—POST OFFICE—Treas. Dpt. at office sup. Archt., U. S. Post Office.

Ind., Vincennes—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, 5th and Busseron Sts.

Me., South Portland—OFFICE—Treas. Dpt. at office Sup. Archt., office, storage, supply house, sheds, foot Mussey St.

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Mass., Andover—POST OFFICE—Treas. Dpt. at office Sup. Archt. post office, Main St. near Dover St. Noted Oct. 30.

Mass., Bedford — HOSPITAL — Vet. Bu., Arlington Bldg., hospital addition, Hillside Ave.

Mass., Boston—POSTAL WORKSHOP—Treas. Dpt. at office Sup. Archt., 5 story, 100x600 ft. central postal workshop. Private plans.

Minn., Minneapolis—POST OFFICE—Treas. Dpt. at office Sup. Archt., plans by Magney & Tusler, 104 South 9th St., rein.-con., brick, stone, between Marquette and 2nd Aves. S., 1st and 2nd Sts. Noted Dec. 11.

N. J., Manasquan—DREDGING—U. S. Eng., Army Bldg., Whitehall St., New York, soon takes bids dredging in Manasquan River.

New York—DREDGING—U. S. Eng., Army Bldg., Whitehall St., New York, soon takes bids dredging in Anchorage Channel, New York Harbor.

New York—DREDGING—U. S. Eng., Army Bldg., Whitehall St., New York, soon takes bids dredging in Bay Ridge and Red Hook, and in Newtown Creek.

N. D., Bismarck—DOMESTIC ARTS BUILDING—U. S. Indian Serv., 40x50 ft. wood, concrete domestic arts building.

N. C., Oteen—HOSPITAL, etc.—Vet. Bu., Arlington Bldg., hospital, recreation hall, laundry, power building officers and employees quarters at U. S. Veterans Hospital 60.

Okla., Hobart—POST OFFICE———Treas. Dpt. at office Sup. Archt., post office.

Okla., Modill—DAM—U. S. Eng., surveys dam and diversion channel on Red River, near here. Private plans.

Okla., Norman—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, Main St.

Okla., Stillwater—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office.

Pennsylvania—LOCK and DAMS—U. S. Eng. Office, Pittsburgh, soon takes bids emergency work, locks, dams in Allegheny River.

R. I., Newport—COLLEGE—Yards & Docks, Navy Dpt., Wash., D. C., auditorium, dormitory, engineering department building at U. S. Naval College.

Tex., Fort Worth—POST OFFICE—Treas. Dpt. at office Sup. Archt., bids latter part month U. S. Post Office. W. C. Hedrick, 1st Natl. Bldg., archt. Noted Jan. 29.

Tex., Latuna — FEDERAL PRISON — Dpt. Justice federal prison, probably here.

Tex., Presidio—FUMIGATING PLANT—Dpt. Interior, brick, concrete fumigating plant. $40,000. Work will probably be done by day labor.

Tex., Wichita Falls—POST OFFICE, etc.—Treas. Dpt. at office Sup. Archt., plans by Voelcker & Dixon, Inc., Wichita Falls, post office, court house. Noted Nov. 27.

France, Paris—EMBASSY—State Dpt., Wash., D. C., plans by Delano & Aldrich, 126 East 38th St New York, embassy.

BIDS ASKED

Ariz., Tucson—HOSPITAL—Mar. 10, by Vet. Bu., Arlington Bldg., veterans hospital addition. Noted Dec. 4.

Calif., Stockton—DREDGING—Feb. 13, by U. S. Eng., Sacramento, 4,320,000 cu.yd. in Stockton Channel from mouth Mormon Channel to Burns Cut-off, San Joaquin River.

D. C., Wash.—FOUNDATIONS—Feb. 26, at office D. Lynn, archt. of Capitol, excavation and foundations for United States Supreme Court Building, on Squares 727 and 728; adv. E. N.-R. Feb. 5. Noted Jan. 16.

D. C., Wash.—GALVANIZED ROOFING, etc.—Feb. 11, by A. L. Flint, genl. purch. officer Panama Canal, galvanized roofing and siding, rolling door, steel pipe, bronze propellers, insulated wire, fire bricks, pig tin, etc., Schedule 2626.

D. C., Wash.—STEEL WINDOWS, etc.—Feb. 12, by A. L. Flint, genl. purch. officer Panama Canal, steel windows, cable, wire, cable terminals, electric fixtures, etc., Schedule 2627.

Florida—DREDGING—Feb. 19, by U. S. Eng., Jacksonville, 951,000 cu.yd. material in Biscayne Bay Sect., Intracoastal Waterway from Jacksonville to Miami; adv. E. N.-R. Feb. 5.

Ind., Warsaw—POST OFFICE—Feb. 19, by Treas. Dpt. at office Sup. Archt., U. S. Post Office. Noted Jan. 1.

La., Shreveport—MAINTENANCE SHOP, etc.—Mar. 5, by Con. Q. M. Office, Barksdale Field, quartermaster maintenance shop, quartermaster warehouse, quartermaster garage, at Barksdale Field; adv. E. N.-R. Feb. 5. Noted Jan. 15.

Idaho, Nampa—FEDERAL—Mar. 6, by Treas. Dpt. at office Sup. Archt. federal building.

Mass., Boston—STEEL BOOM, etc.—Feb. 10, by Bureau Supplies & Accounts, Navy Dpt., steel boom and fittings, copper nickel alloy (bar) for Navy Yard.

Mass., Springfield—ELEVATOR—Feb. 16, by Treas. Dpt. at office Sup. Archt., installing complete elevator plant in new U. S. Post Office. Noted Jan. 15.

Michigan—DREDGING—Mar. 10, by U. S. Eng., Detroit, deepening Course 6, rock cut West Neebish Channel; adv. E. N.-R. Feb. 5.

N. J., Camden—POST OFFICE—Mar. 4, by Treas. Dpt. at office Sup. Archt., constructing (except elevators), U. S. Post Office, Court House; adv. E. N.-R. Feb. 5.

N. Y., Brooklyn—POLES—Feb. 17, by Signal Supply Officer, Signal Sect., New York General Depot, Army Base, poles.

N. Y., New York—FOUNDATIONS, etc.—Feb. 20, by Treas. Dpt. at office Sup. Archt., foundations, etc., for U. S. Parcel Post Building; adv. E. N.-R. Feb. 5. Noted Dec. 25.

North Carolina and Florida—DREDGING—Feb. 10, by U. S. Eng., Wilmington, N. C., 10,383,313 cu.yd. in Cape Fear River to Little River portion Intracoastal Waterway from Cape Fear River, N. C., to St. Johns River, Fla.; adv. E. N.-R. Feb. 5.

Pa., Pittsburgh — BARGES — Feb. 28, by U. S. Eng., Pittsburgh, two 7 x 26 x 100 ft. steel barges; adv. E. N.-R. Feb. 5.

Tex., Lubbock—POST OFFICE—Treas. Dpt. at office Sup. Archt. bids about Mar. 15, 3 story, basement, 87 x 104 ft., brick, stone. Noted Jan. 22.

Vt., East Richland—INSPECTION STATION—Feb. 24, by Treas. Dpt. at office Sup. Archt., inspection station; adv. E. N.-R. Feb. 5.

Va., Fort Monroe—QUARTERS—Mar. 3, by Con. Q. M., bachelor officers' quarters; adv. E. N.-R. Feb. 5.

CONTRACTS AWARDED

Arkansas—LEVEE WORK—U. S. Eng., P. O. Box 667, Vicksburg, Miss., 100,000 cu.yd. levee work on south bank Arkansas River, to D. Elkas, Greenville, Miss., at $0.1525 per cu.yd. Noted Jan. 15.

Calif., Eureka—DREDGING—U. S. Eng., San Francisco, 525,420 cu.yd. in Humbolt Bay, to Longview Dredging Co., Longview, Wash., at $0.3225 per cu.yd. Noted Jan. 15.

Calif., Fort Bragg—JETTY and DREDGING—U. S. Eng., San Francisco, jetty and dredging in Noyo River, to Dutton Dredge Co., Mills Bldg., San Francisco, $178,720. Noted Jan. 22 Daily.

Calif., March Field (br. Riverside)—APRONS—Con. Q. M., March Field, amiesite on colas paving hangar frontage, to Osborn Co., 450 California Terrace, Pasadena, at $0.11 per sq.ft. Est. $100,000. Noted Jan. 8.

Calif., Richmond—TRAINING WALL—U. S. Eng., San Francisco, 81,000 tons core rock and 18,000 tons facing rock, building extension to training wall, Richmond Harbor, to Healy-Tibbits Constr. Co., 64 Pine St., San Francisco, at $0.8975 and $2.25 per ton respectively. Noted Dec. 18.

Calif., San Francisco—BOILERS—Con. Q. M., Fort Mason, three 100 hp. boilers at Central Heating Plant, Fort McDowell, to Kewanee Boiler Co., 647 Minna St., $5,972. Noted Jan. 8.

Calif., San Rafael—DREDGING—U. S. Eng., Custom House, San Francisco, 42,115 cu.yd. San Rafael Creek, Marin Co., to F. C. Franks Contg. Co., 260 California St., San Francisco, at $0.31 per cu.yd. Noted Jan. 1.

Conn., Bridgeport—DREDGING—U. S. Eng., Providence, R. I., 873,600 cu.yd. in Bridgeport Harbor, to Trimount Dredging Co., 10 State St., Boston, Mass., $124,924. Noted Jan. 8.

Georgia—DREDGING—U. S. Eng., P. O. Box, Savannah, dredging channel in Black River from St. Simons Sound to Mill Creek, to Globe Dredging Co., 204 West Bay St., Savannah, $32,767; channel in Turtle River, to Atlantic, Gulf & Pacific Co., 13 Park Row, New York, $471,955; Kings Island Channel in Savannah Harbor, to District Eng., by government plant, $64,503. Grand total $569,205. Noted Jan. 8.

Illinois—DIKES—U. S. Eng., Customhouse, St. Louis, Mo., 3,000 ft. dikes at Sulphur Springs and James Landing, to Massman & Peterman, St. Louis, Mo., $164,425; 3,500 ft. Ste. Genevieve Island and Klondike Landing, to W. P. McGeorge, Pine Bluff, Ark., $156,020; 2,000 ft. at Buffalo and Dogtooth Islands, to Woods Bros. Constr. Co., 132 South 13th St., Lincoln, Neb., $88,250. Grand total $408,695. Noted Jan. 8.

Mass., Fall River—DREDGING—U. S. Eng., Providence, R. I., 1,124,900 cu.yd. Fall River Harbor, to Morris Cummings Dredging Co., 44 Whitehall St., New York, $230,604. Noted Jan. 29.

Minn., Minneapolis—DREDGING—U. S. Eng., Commerce Bldg., St. Paul, dredging 260,000 cu.yd. in Mississippi River, below Washington Avenue Bridge, to Al. Johnson Constr. Co., 1409 Foshay Tower, Minneapolis, at $0.74 per cu.yd. Noted Jan. 21.

Missouri—DIKES—U. S. Eng., Postal Telegraph Bldg., Kansas City, 9,360 ft. standard pile clump dikes, in Missouri River, East Bottoms and Blue River, 8 mi. from Sugar Creek, to

Federal Government (Continued)

Woods Bros. Constr. Co., 132 South 13th St., Lincoln, Neb., $309,800. Noted Jan. 26 Daily.

Nevada—RAILROAD — Bureau Reclamation, Las Vegas, 10.25 mi. railroad from Summit (near Boulder City townsite to Hoover Dam, Boulder Canyon Project, Arizona-California-Nevada, to Lewis Constr. Co., 300 South Juanita St., Los Angeles, Calif., $455,510. Noted Dec. 11.

Nev., Las Vegas—ROAD—Bureau Reclamation, highway from Boulder City to Boulder Canyon Dam Project (Hoover Dam), to General Constr. Co., Colman Bldg., Seattle, Wash., $329,917. Noted Dec. 4.

N. Y., New York—REMODELING—Treas. Dpt. at office Sup. Archt., remodeling (except elevators) U. S. Old Appraisers Stores Building, to Wills & Mafera Corp., 303 West 42nd St., $323,000. Noted Dec. 25.

North Carolina — DREDGING — U. S. Eng., Wilmington, Sects. 1 and 3, Cape Fear River and Moorhead City Harbor, to Atlantic, Gulf & Pacific Co., 13 Park Row, New York; Far Creek and Silver Lake Harbor, to Harrison Wright Co., Charlotte; Beaufort Harbor, to Lukens Dredging & Contg. Corp., 402 Snow Bldg., Baltimore, Md.; Sect. 2, Cape Fear River, by government forces. Noted Jan. 1.

N. C., Kitty Hawk—MONUMENT—Con. Q. M., Munition Bldg., Wright Memorial, on Kill Devil Hill, to Wills & Mafera, 303 West 42nd St., New York, $233,000. Noted Jan. 8.

Texas—DREDGING—U. S. Eng., Galveston, dredging enlargement Texas City Harbor Channel, from Galveston Harbor to Texas City, to Atlantic, Gulf & Pacific Dredging Co., Galveston, at $0.067 per cu.yd., total $33,500. Noted Jan. 1.

Wis., Milwaukee—BREAKWATER—U. S. Eng. rebuilding 758 ft. south breakwater to Merritt, Chapman & Whitney Corp., Duluth, Minn., $338,200. Noted Dec. 11.

FOREIGN

Argentina, Avellaneda—City paving 617,000 sq.yd., to Warren Bros. Co., 38 Charles River Rd., Boston, Mass. Est. $4,000,000.

India—Ford Motor Co., 3674 Schaefer Rd., Dearborn, Mich., soon lets contract assembly plants in Bombay, Calcutta, Madras and Multan. To exceed $1,000,000.

Mexico—Government of Mexico, Mexico City, soon lets contract constructing and operating under government concession 400 mi. railroad from Santa Lucrecia to Campeche.

New Zealand, Wellington—Apr. 14, by Dpt. P. Wks., 4 single phase 110,000 volt transformers.

Yugoslavia—Novisad Electric Co., c/o International Pub. Serv. Corp., c/o J. G. White & Co., 37 Wall St., New York, plans power plant, additional facilities in Novisad and vicinity. To exceed $1,000,000. **Maturity indefinite.**

GRADE CROSSINGS

PROPOSED WORK

Ill., Decatur—Bd. Local Imprvts., O. W. Smith, pres., and Wabash R.R. Co., Exchange Bldg., St. Louis, Mo., W. R. Bennett, ch. engr., soon takes bids subway under Wabash R.R. and North Main St. $148,087. M. P. O'Brien, city engr.

Ill., Decatur — City Comn., A. Van Praag, comr., new subway at East Orchard St. under Illinois Central R.R. M. P. O'Brien, City Hall, engr.

Ill., Decatur—City Council subway under Illinois Central R.R., at South Main St. M. P. O'Brien, City Hall, engr.

Ill., Springfield—City, H. N. Smith, mayor, Chicago & Alton R.R. Co., 340 West Harrison St., Chicago, A. Chinn, ch. engr., and Chicago & Illinois Midland R.R. Co., Springfield, C. H. Paris, ch. engr., subway under tracks, at Sangamon Ave. $240,000.

Mass., Weston — Town, Bd. Selectmen, and Boston & Maine R.R., W. J. Backes, ch. engr., Boston, abolishing Stoney Brook Crossing and regrading. Town appropriates $20,000 toward cost.

Missouri—State Rd. Dpt., Jefferson City, and Chicago, Burlington & Quincy R.R. Co., A. W. Newton, ch. engr., 547 West Jackson Blvd., Chicago, Ill., rein.-con. viaduct to carry State Hy. 77 under railroad tracks, St. Louis Co., $35,000; and subway where State Hy. 116 intersects railroad tracks in Clinton Co., $37,000.

N. J., Atlantic City—Bd. Freeholders Atlantic Co., Guarantee Trust Bldg., eliminating 2 grade crossings at Tilton Rd. intersections of Reading and Pennsylvania R.R. $25,000. Project in abeyance. Noted Oct. 23.

N. Y., Cayuta—Lehigh Valley R.R. Co., G. T. Hand, ch. engr., 143 Liberty St., New York, awards contract in March eliminating Dean Crossing, Schuyler Co. $125,000. Noted Jan. 24, 1929.

N. Y., New Albion—Erie R.R. Co., G. S. Fanning, ch. engr., 50 Church St., New York, awards contract in March, eliminating Paingleton, Middle and Winship Crossings. $60,000.

N. Y., Hamburg—Erie R.R. Co., G. S. Fanning, ch. engr., 30 Church St., New York, awards contract in March, eliminating Big Tree Road Crossings, Erie Co. $262,400. Noted Oct. 23.

Okla., Miami — City preliminary plans new underpass at 2nd and South Main Sts. $150,000. W. L. Rush, mayor.

Okla., Duke—State Hy. Dpt., Oklahoma City, preliminary plans 6 span 98 ft. rein.-con. underpass under Missouri, Kansas & Topeka Ry., Jackson Co. $25,000. A. R. Losh, hy. engr.

Pa., Erie—City, bids probably in spring subway under railroad at Cranberry St. $375,000; elevating crossing over railroad at East Ave., $375,000. A. N. Aiken, City Hall, engr.

Tex., Fort Worth — City, steel, rein.-con. underpass under Missouri, Kansas & Texas R.R., South Main and Bryan Sts. $100,000. D. L. Lewis, city engr.

Ont., Toronto—North York Twp. extending Eglinton Ave., incl. subway under Canadian Pacific R.R. tracks, concrete abutments, retaining walls, steel span. $60,000. G. Baker, Township Offices, Willowdale, engr.

BIDS ASKED

Ont., Toronto—Feb. 10; by T. T. Irving, ch. engr. (Central Region) Canadian Natl. Ry., New Union Sta., rein.-con. subway under railway tracks, on St. Clair Ave. W., incl. drainage, concrete retaining walls, abutments, piers and slabs, for City and Canadian Natl. Ry., New Union Sta. $100,000.

CONTRACTS AWARDED

Calif., Oakland — Engineering Department Southern Pacific R.R. Co., 65 Market St., San Francisco, G. W. Boschke, ch. engr., 167 ft. subway, barrel shape, 14 ft. vertical clearance, 23 ft. roadway, 7th St., to J. F. Knapp, Financial Center Bldg., $123,465. Noted Jan. 15.

Calif., Santa Cruz—Santa Cruz Co., steel bridge with concrete floor over Southern Pacific R.R., near Felton Station, to C. C. Gildersleeve, 1508 G St., Napa, $33,989. Noted Jan. 22.

N. Y., Hamburg—See "Streets and Roads."

Tex., Fort Worth—Texas & Pacific R.R., E. F. Mitchell, ch. engr., Dallas, 130 ft. rein.-con. underpass under railroad tracks, to R. F. Ball Constr. Co., 512 Elect. Bldg., Fort Worth, est. exceeds $25,000.

GRAIN ELEVATORS

BIDS ASKED

Mo., Kansas City—GRAIN ELEVATOR—Missouri Pacific Ry. Co., E. A. Hadley, ch. engr., Missouri Pacific Bldg., St. Louis, bids about Mar. 1, superstructure 2,500,000 bu. grain elevator, rein.-con. Topping Ave. and railroad tracks, $1,500,000. E. M. Tucker, c/o owner, archt. E. Ahlskog, 407 South Dearborn St., Chicago, Ill., consult. engr. Continental Export Co., Merchants Exch. Bldg., lessee. Foundation contract awarded to List & Weatherly Constr. Co., Railway Exch. Bldg., excavation to Winston Bros., Buder Bldg., St. Louis; pile driving, to Bilhorn, Bowers & Peters, Railway Exch. Bldg., St. Louis. Noted Nov. 20.

CONTRACTS AWARDED

Mo., Kansas City—GRAIN ELEVATOR—See "Bids Asked."

Tex., Fort Worth—GRAIN ELEVATOR—Lone Star Elevator Co., Fort Worth, grain elevator addition. $55,000. Owner builds.

MATERIALS

PROPOSED WORK

CEMENT—**Santa Ana, Calif.**—Bd. Supervs. Orange Co., purchasing 10,500 bbl. cement f.o.b. Buena Park; 7,000 bbl. f.o.b. Westminister, to be used widening streets.

SEWER PIPE—**Tulare, Calif.**—City, purchasing 3,500 ft. 18 in. hydraulic concrete sewer pipe. R. M. Berryhill, city mgr.

CEMENT — **Syracuse, N. Y.** — Purchasing Agent, Onondaga Co., soon takes bids 100,000 bbl. cement for 1931 hy. work, for Co. Hy. Dpt.

BIDS ASKED

OIL and MINERAL AGGREGATE—**Los Angeles, Calif.**—City Purchasing Agent taking bids 200 tons per day oil and mineral aggregate during balance fiscal year to June 30.

LUMBER, etc.—**Red Oak, Calif.**—Feb. 26, at office Auditor Montgomery Co., fir lumber, treated lumber, treated piling, 600 bbl. cement, 3,700 ft. culvert pipe.

SPECIAL CASTINGS—**Chicago, Ill.**—Feb. 9, by City, at office Dpt. P. Wks., City Hall, furnishing, delivering, distributing on various streets, 340 tons Standard special castings for 30 in., 36 in. and 48 in. water pipe. R. W. Wolfe, comr.

WATER PIPE—**Chicago, Ill.**—Feb. 9, by City, at office Dpt. P. Wks., City Hall, 16,365 tons 30, 36 and 48 in. c.i. water pipe. R. W. Wolfe, comr.

LUMBER, etc.—**Cherokee, Ia.**—Feb. 18, at office Auditor Cherokee Co., plain and treated plank, treated dimension lumber, treated piling, corrugated culvert pipe, plain concrete pipe, rein.-con. pipe.

LUMBER, etc.—**Red Oak, Ia.**—Feb. 26, at office Auditor Montgomery Co., fir lumber, treated lumber, treated piling, 600 bbl. cement, 3,700 ft. culvert pipe.

BRICK—**Minneapolis, Minn.**—Feb. 13, by F. S. Gram, city purch. agent, 2,000,000 paving brick. Former bids rejected. N. W. Elsberg, city engr. Noted Jan. 22.

GRAVEL and STEEL I-BEAMS—**Mississippi**—Feb. 10, by State Hy. Comn., Jackson, furnishing 4,900 tons washed gravel on U. S. Rd. 90; 37,850 lb. structural I-beams, 61 ft. over all.

ROAD SURFACE DRESSING—**Freehold, N. J.**—Feb. 18, by Freeholders Monmouth Co., Court House, 140,000 gal. tar road surface dressing; 290,000 gal. asphaltic road oil; 20,000 gal. lignin binder. G. K. Allen, Jr., Red Bank, co. engr.; adv. E. N.-R. Feb. 5.

STEAM CINDERS—**New York, N. Y.**—Feb. 9, by H. Bruckner, pres. Crotona Park, 3rd and Tremont Aves., 60,000 cu.yd. steam cinders, assembled malleable c.i. street signs, and 30,000 new granite blocks (modern).

ASPHALT SAND, etc.—**New York, N. Y.**—Feb. 11, by S. Levy, pres. Manhattan Boro. Municipal Bldg., 25,000 cu.yd. asphalt sand, 2 portable air compressors, standard manhole heads, special roadway manhole covers; basins, hoods, plates, water manhole covers, barrel sewers, straight flat, radius flat and straight herringbone bars.

BITUMINOUS CONCRETE—**St. George, N. Y.** etc.—Feb. 11, by J. A. Lynch, pres. Richmond Boro, Boro Hall, 500 tons bituminous concrete in Dists. 1, 2 and 3; 50,000 gal. fuel oil Grade B, 300,000 gal. asphaltic macadam binder, hot application; 75 tons asphaltic cement; 60,000 gal. asphaltic cement; 1,000 cu.yd. concrete and paving sand; 1,400 cu.yd. trap rock screenings; 2,100 cu.yd. 1½ in. broken stone; 4,200 cu.yd. 1¼ in. broken stone, 8-8; 3,000 cu.yd. 1¼ in. broken stone, 8-8, 2,400 cu.yd. ¾ in. broken stone chips.

CONTRACTS AWARDED

CRUSHED ROCK and SAND — **Los Angeles, Calif.**—City, to Consolidated Rock Products Co., 656 South Los Angeles St., 1,200 tons crushed rock per month for period of 5 months $10,200. 1,700 tons sand per month for period 5 months $5,100, 2,500 tons crushed rock per month, period indefinite, to exceed $12,000.

PIPE—**Bogalusa, La.**—City, 3,100 ft. 16 in. and 1,200 ft. 12 in. Bell and Spigot Class B c.i. pipe, to National Cast Iron Pipe Co., Tarrant City, Birmingham, Ala.

PORTLAND CEMENT—**Boston, Mass.**—City Supply Dpt., portland cement as specified and delivered as required, to Portland Stone Ware Co., 80 Federal St., at $2.24 per bbl.

ASPHALT SAND—**Detroit, Mich.**—Dpt. P. Wks., City Hall, 95,000 cu.yd. asphalt sand, for city's season requirements, f.o.b. cars Detroit, to Ray Sand & Gravel Co., 2508 Book Bldg., at $1.25 per cu.yd., total $118,750.

PAVING BLOCKS—**New York, N. Y.**—P. J. Dooling, comr. Purchase, Municipal Bldg., wood paving blocks, to J. Meehan Paving Co., 90 West St., $27,105; granite paving blocks, to Hildreth Granite Co., 150 Nassau St., $27,090. Noted Dec. 18.

CAST IRON PIPE—**Providence, R. I.**—City, Bd. Contr. & Supply, furnishing Certain B. c.i. cement lined water pipe to Public Wks. Dpt., as specified, to U. S. Cast Iron Pipe & Fdry. Co., Morris Bldg., Phila., Pa.

CAST IRON PIPE—**Beaumont, Tex.**—City, furnishing 50,000 ft. 20 in. c.i. pipe, welded joint for watermains, to McWane Cast Iron Pipe Co., 3700 11th Ave. N., Birmingham, Ala. Noted Jan. 29.

PARKS AND SPORTS

PROPOSED WORK

Calif., Pomona—Los Angeles Co. plans by K. Muck, co. archt., Hall of Records Bldg., 18,000 seating capacity rein.-con. grandstand, at County Fair Grounds. $175,000.

Fla., Miami Beach — Miami Yacht Club, L. Ramsdell, E. Kelso, W. Kelner, Congress Bldg., Miami, granted charter with power to incur indebtedness and own real estate to $150,000, sketches accepted, incl. concrete piling, floating docks, swimming pool, tennis courts, clubhouse to have terrace in front and back, incl. large entrance hall, lounge, dining room, service pantry, kitchen, men's locker rooms, etc. J. and C. Skinner, Coral Gables, archts. C. B. Schoeppl, Miami Beach, assoc. archt.

Me., Kents Hill — Kents Hill Seminary, Bd. Trustees, F. E. Eastman, pres., athletic field, seminary grounds. $25,000. Engineer not selected.

Me., Kents Hill—Maine Wesleyan Seminary & Womens College, T. W. Watkins, soon takes bids 1 story, brick, concrete, 70x120 ft. and 25x100 ft. gymnasium and locker. $70,000.

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Parks and Sports (Continued)

Bunker & Savage, 256 Water St., Augusta, archts.

Mass., Boston—City, Park Dpt., 33 Beacon St., improving playground, incl. baseball and football field, Stanley Ringer Playground, Allston. $25,000. J. J. Murphy, c/o Park Dpt., engr.

Mass., Boston—City, Park Dpt., 33 Beacon St., revised sketches stadium, locker, baseball field, football field and tennis court, Dunbar Ave., Dorchester. $100,000. J. J. Murphy 33 Beacon St. engr.

Mass., Boston—City, Park Dpt., 33 Beacon St., playground improvements, incl. grading, filling, ball park, etc., at Wellington St. Playground, East Boston. $35,000. J. J. Murphy, Park Dpt., engr.

Mass., Boston—City, Park Dpt., 33 Beacon St., sketches by J. G. McGann, 129 Newbury St., locker, Billings Field, West Roxbury. $65,000. Noted Jan. 15.

Mass., Boston—City, Park Dpt., 33 Beacon St., improvements, incl. grading, filling, baseball and football fields at Smith Pond Playgrounds, Hyde Park. $25,000.

Mass., Brighton—Harvard University, A. L. Lowell, pres., Cambridge, indoor athletic building, Soldiers Field. To exceed $25,000. Engineer not selected.

Mass., Milton (br. Boston)—Commonwealth of Massachusetts, Metropolitan Dist. Comn., golf course, Redman Farm, Blue Hills Reservation. To exceed $25,000.

Mass., Oak Bluffs — Town, A. F. Leonard, chn. School Bd., sketches by P. J. Taeger, Oak Bluffs, gymnasium, auditorium, lockers in rear of school. $25,000. Noted Dec. 11.

Mo., St. Louis—City, F. Pape, park comr., preliminary plans improving parks, playgrounds, incl. roadways, landscaping, $120,000. Private plans.

N. J., Bernardsville—J. J. McGuirk, Jr., 22 Morristown Rd., will not build concrete, tile swimming pool. $25,000. Project abandoned. Noted June 26.

N. J., Highland Park—Bd. Educ., will not build playground adjoining Franklin Junior High School. $65,000. Project abandoned. Noted Oct. 2.

N. J., Linden—Bd. City Council, City Hall, will not build concrete, tile swimming pool, $25,000. Project abandoned. Noted July 10.

N. J., Linden—Bd. Educ., St. George Ave., will not build city playground at P. S. 3, South Grier Ave. $25,000. Project abandoned. H. B. Brady, Inc., 333 North Broad St., archt. Noted Aug. 14.

N. J., Linden—Union County Park Comn., Court House, Elizabeth, concrete, tile swimming pool in Russell Wheeler Park. $50,000. Engineer not selected.

N. J. South River—Bd. Council Boro Hall, concrete, tile swimming pool. $30,000. Project in abeyance. Engineer not selected. Noted Aug. 28.

N. J., Union City—Bd. City Comrs., City Hall, revised preliminary plans Rannenberg Stadium and athletic field, incl. running track, tennis courts, minature golf links, etc. between Summit Ave. and Hudson Blvd., 24th and 27th Sts. $500,000. G. W. Thompson, 324 Montgomery St., Syracuse, N. Y., archt. H. C. Thourot, 708 Bergenline Ave., Union City, engr. Noted Nov. 27.

N. J., West New York — Bd. Town Council, Municipal Bldg., grading, excavating, wire fencing, electrical lighting system at playground Jackson St. between 13th and 15th Sts. F. Oleri, 650 Bergenline Ave., town engr.

N. Y., Long Island City—Sunnyside Outdoor Recreation Center, 501 Madison Ave., New York, bids early in February, revised plans lockers and sports, 51st St. and Roosevelt Ave. To exceed $40,000. W. Haugaard, 185 Madison Ave., archt. Noted Dec. 11

Okla., Tulsa — I. Thomas, Wichita, Kan., owner of Tulsa Western League Baseball Club, grandstand. $80,000. H. Gregory, mgr.

Tex., Galveston—S. Moody & Associates preliminary plans baseball park, incl. 10,000 seating capacity grandstand, field. $75,000 or more. Private plans.

Tex., Galveston—City improving, developing 200 acre site as recreational and playground project, incl. municipal golf course, etc.

Ont., Toronto—Spadina Gardens, Ltd., c/o A. J. Everett and J. D. Wilson, archts., 2 Leader Lane, brick, steel, concrete, stone sports arena, 16,000 to 20,000 seating capacity, with 90 x 200 ft. ice surface, 45 stores, artificial ice plant, parking for 1,000 cars, Spadina Ave. $1,500,000.

BIDS ASKED

Mass., Pittsfield—See "Contracts Awarded."

CONTRACTS AWARDED

Mass., Gloucester—C. Birdseye, Bass Rocks, landscape work at Eastern Point, incl. drives,

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grading, terraces, walks, walls, to Gillis & Clune, Highland Rd., Nahant. Est. exceeds $25,000.

Mass., Pittsfield—City, H. K. Webber, P. Wks. Dpt., grading, filling Wahconah Park, day labor (unemployment project). $25,000.

Okla., Stillwater—Oklahoma Agricultural & Mechanical College, new athletic stadium, on campus, to R. S. Lyons, 321 East 2nd St., Oklahoma City, $150,000. Noted Dec. 26, 1929.

PIERS AND WHARVES

PROPOSED WORK

Mass., Barnstable—PIER, etc.—Town, G. W. Hallett, chn. Building Comn., public fish pier and fish house at waterfront, Hyannis Sect. $25,000 or more. Engineer not selected.

Mass., Bourne—WHARF—Monument Beach Assn., Buzzards Bay wood pile public wharf at Monument Beach Sect. $25,000. Private plans.

Mass., Fall River—PIER——Commonwealth of Massachusetts, Dpt. P. Wks., Boston, State Pier, waterfront. $40,000. A. W. Dean, Dpt. P. Wks., Boston, engr.

CONTRACTS AWARDED

Mass., Beverly—WHARF—See "Warehouses."

POWER AND LIGHTING

PROPOSED WORK

Calif., Alameda—City electrolier lighting system, incl. underground wiring in Webster St. between segregation line and Central Ave., $83,505: Forty-eight 2-lamp electrolier standards, $18,062. B. Hamilton, city engr.

Calif., Glendale—Floor lighting system for street lighting portions Brand Blvd. $125,000.

Calif., Los Angeles—Los Angeles Co., ornamental street lighting system, incl. underground system, metal standards on Compton Ave. from Slauson Ave. to Nadau St., $44,500; San Gabriel Blvd. from Southern Pacific R.R. to Ramona Blvd., $32,500: Garvey Ave. from San Gabriel Blvd. to Wilmar Dist., $40,000; using Marbelite standards, Eastern Ave. from Whittier Blvd. to Noakes St. and between Ramona Blvd. and Medford St. $55,000. J. R. Rockhold, co. surv.

Calif., Los Angeles—Los Angeles Co., ornamental street lighting system, Marbelite standards, underground system on Eastern Ave., Whittier Blvd., et al., $25,000 or more: Pepper Dr., et al., to exceed $25,000; using metal standards, Firestone Blvd., $75,000 or more: Firestone Blvd. and Downey-Norfolk Rd., to exceed $50,000. J. R. Rockhold, Los Angeles, co. surv.

Calif., Los Angeles—Los Angeles Co., ornamental street lighting systems, incl. underground system, "Marbelite" standards in 3rd St. and Mesa Dr., $40,000; Jefferson Blvd., Bellflower and Mesmer City Sections, $46,000; using metal standards in Sunset Blvd. and West Hollywood Dist., $80,000: Clark St., et al., West Hollywood Section, $45,000. J. R. Rockhold, co. surv.

Conn., West Hartford (br. Hartford)—Town, I. Miller, town mgr., 600 candle power lights, 110 ft. apart on all principal streets in business section.

Ill., Lake Forest—City Council bids in spring, ornamental street lighting system, 13 ft. concrete standards topped by bronze brackets. $100,000. N. Campbell, city engr.

Ill., Peoria—Central Illinois Light Co., 316 South Jefferson St., reconstructing high tension electric line over east approach new bridge over Illinois River, incl. two 130 ft. towers, replacing one of less height. $15,000. Private plans.

Ill., Peoria—Central Illinois Light Co., 316 South Jefferson St., R. S. Wallace, genl. mgr., extensions and improvements to electric division. $275,000. Private plans.

Minn., Detroit Lakes—H. H. Henley, 603 Foshay Tower, Minneapolis, soon takes bids gas plant, distribution system, incl. building, storage tanks, laying mains, service connections. $60,000. Private plans.

Okla., Garber—City, preliminary plans natural gas distribution system. $25,000. R. R Ayers, mayor.

Okla., Perry—Preliminary plans gas distribution system. $75,000. P. Daniels, Perry, engr.

Okla., Porum—City, C. Fox, clk., franchise election Feb. 10, natural gas system to H. E. Dowd. $25,000. Private plans.

Okla., Vinita—City, A. Cowell, clk., franchise, election Apr. 7, natural gas system to Vinita Fuel Co. $40,000. Private plans.

Okla., Watonga—Preliminary plans municipal gas system. $25,000. H. S. Cunningham, mayor.

Tex., El Paso—El Paso Electric Co., Martin Bldg., power or transmission lines. $100,000. Private plans.

Ont., Orillia—Council, complete renovation and extension of street lighting system. $25,000. R. H. Starr, engr., c/o Orillia Light & Power Comn., preparing report.

BIDS ASKED

Ill., Chicago — Feb. 11, by M. J. Kennedy, comr. Gas & Electricity, City Hall, electric light and fire alarm cable, wire of various kinds and amounts, for maintenance and extension municipal street lighting, fire alarm and police signal systems during year 1931; also malleable iron castings, manhole frames and covers, adapter collars, porcelain line insulators, c.i. pole tops, ornamental base castings, pipe flanges, strain pins, fibre conduit.

RAILWAYS

PROPOSED WORK

California — California State Bd. Harbor Comrs., Ferry Bldg., San Francisco, surveys extending Belt Line R.R. into area south of Islais Channel, San Francisco. To exceed $25,000. F. G. White, Ferry Bldg., San Francisco, engr.

California—Interstate Comn. Southern Pacific R.R. Co., 65 Market St., San Francisco, G. W. Boschke, ch. engr., extending 2.4 mi. single track, incl. wharves, docks, on Andrus Island (part of Sacramento Delta) from Isleton to point near Golden Gate Cannery, at confluence of Mokelumne River and Georgiana Slough. $151,840.

California — Southern Pacific R.R. Co., 65 Market St., San Francisco, G. W. Boschke, ch. engr., 2.5 mi. feeder extension from Isleton to Georgia Slough and Mokelumne River $96,000, dock at Isleton $50,000. Private plans.

Illinois—Illinois Power & Light Corp., Springfield, A. D. Mackie, genl. mgr., reconstructing street car tracks, East Capitol Ave. prior to paving same, in Springfield. $50,000.

Washington—Municipal Railway Department, A. S. Pierce, assistant supt. Pub. Utilities, soon takes bids 2.09 mi. double track on 8th Ave. N. W. in Saettle. $160,000.

BIDS ASKED

Indiana—See "Contracts Awarded."

CONTRACTS AWARDED

Indiana—New York Central R.R. Co., 466 Lexington Ave., New York, E. B. Freeman, ch. engr., c/o J. N. Gavit, atty., Hammond, new switch yard for freight business, 100 acre site in West Gary, day labor and separate contracts. $10,000,000. J. N. Gavit, Hammond, is handling project.

SEWERS

PROPOSED WORK

Ark., Dumas—City Council bids in March or April, 41,383 ft. 6- to 15-in. sewers, 4,020 ft. 15 in. and 1,130 ft. 18 in., storm drains, 2 lifting stations of 2 units each, sewage disposal plant, Imhoff tank with accessories in Sewer Impvt. Dist. 1. $60,000. F. R. Allen, Pine Bluff, engr. Noted Jan. 8.

California—Cities of San Mateo, Burlingame and Hillsborough, surveys joint sewerage system. Burns-McDonnell-Smith Eng. Co., 402 Interstate Bldg., Kansas City, Mo., engrs.

Conn., Middletown—Sewage treatment works. $750,000. G. A. Schaefer, city engr. T. F. Bowe, 110 William St., New York, consult. engr. Noted Jan. 22.

Ill., Joliet—Bd. Pub. Impvts., G. F. Sehring, pres., West Side Sewerage System with outlet at river, trunk line and branches. To exceed $25,000. A. S. Calkins, City Hall, engr.

Md., Baltimore—Bureau Sewers, storm-water drain adjacent to Tiffany Run from Cold Spring Lane to Pen Lucy Ave. $40,000.

Mass., Framingham—Town, Bd. Selectmen, sewers, drains. $25,000 appropriated.

Mass., Mattapoisett—Town, sewerage system, $110,000 appropriated. Whitman & Howard, 89 Broad St., Boston, engrs.

N. J., Elizabeth—Bd. P. Wks., City Hall, storm water sewer in Alicia St., from Cross Ave. to Spring St. $25,000. T. Collins, city engr.

N. J., Newton—Town Comn., Town Com. Room, 115 Spring St., rescinded contracts sewage treatment works, Sect. 1. May take new bids in March. $112,000. T. F. Bowe, 110 William St., New York, consult. engr. Noted Jan. 8 under "Contracts Awarded."

O., Cuyahoga Heights (br. Cleveland)—Village sewers in East 49th St. and part Harvard Ave. $50,000. Sterling Eng. Co., 7016 Euclid Ave., Cleveland, engrs.

Okla., Claremore—Preliminary plans extending 20 blocks sanitary sewers in Catalayah, 5th and Radium Sts. $25,000. J. M. Gano, Claremore, engr.

Pennsylvania—Allegheny Co. (Pittsburgh) sewage treatment plants in towns along Allegheny River from Ford City to New York State line.

Sewers (Continued)

Tex., Houston—City, c/o W. W. Monteith, mayor, sanitary sewage disposal plant on Simm's Bayou. $500,000.

Tex., Houston—City, c/o W. W. Monteith, mayor, soon takes bids 2½ mi. storm and sanitary sewers in Telephone Rd. J. M. Nagle, Houston, engr.

Tex., Waco—Preliminary plans 1½ mi. probably 36- to 48-in. storm sewer lines. $100,000; 2/3 mi. probably 24 in. sanitary sewer lines. $25,000. J. H. Strange, city engr. Noted Dec. 11.

Utah, Brigham City—Preliminary plans sewers in business section. $25,000. C. O. Roskelley, city engr. and city mgr.

Ont., Hanover — Council, sewage disposal system. $30,000. C. R. Hagey, Fort Erie, engr.

Que., Montreal—Soon takes bids sewers in Decarie Blvd. $96,000.

BIDS ASKED

Calif., Los Angeles—See "Contracts Awarded."

Ill., Chicago—Feb. 13, by J. J. Sullivan, clk. Sanitary Dist. of Chicago, 910 South Michigan Ave., altering sludge drying beds, incl. 1,300 lin.ft. concrete wall, 150 lin.ft. transfer track, 4 concrete manholes, 32,000 lb. steel rails furnished and installed, at Calumet Sewage Treatment Works, Div. L, near 125th St. and Cottage Grove Ave. R. A. Woodhull, chn. Finance Com.

Ia., Bloomington—Feb. 11, by W. J. Brown, city clk., 2,814 ft. 12 in. vitr. outfall sewers, 100 ft. 10 in. c.i. pipe under Chicago, Burlington & Quincy R.R., 1,470 ft. 6 in. from North Pumping Station, 2,170 ft. 8 in. vitr. gravity pipe line sewers, 2 automatic duplex vertical centrifugal pumping units installed in small lift stations, Imhoff tank, trickling filter, sludge bed, secondary sedimentation tank, outlet bulkhead, 19 standard manholes, drop manhole, incidental accessories. Howard R. Green Co., 208-10 Bever Bldg., Cedar Rapids, engrs.

Ia., Tama—Feb. 9, by C. E. Davis, city clk., 653 ft. rein.-con. box sewer, 11 ft. wide, 6.5 ft. height, inside dimensions, 4 inlets, $19,000-$20,000. Howard R. Green Co., 208-10 Bever Bldg., Cedar Rapids, engrs.

Md., Baltimore — Feb. 11, by Bd. Awards, storm sewers in Sewer Dist. 37-A, Storm Water Contr. 154. M. J. Ruark, Municipal Bldg., sewerage engr.

Mass., Framingham — See "Contracts Awarded."

N. J., Holmdel—Feb. 17, by C. N. Leathem, State Office Bldg., Trenton, 1,000 ft. sanitary and storm sewers for Dpt. Institutions & Agencies, Trenton.

N. J., Newark — Feb. 9, by Bd. Freeholders Essex Co., storm sewerage system from Irvington-Maplewood line to South Orange Ave., in Maplewood Twp. $25,000. W. Stickles, Court House, co. engr.

N. Y., Buffalo—Feb. 11, by G. Fisk, comr. P. Wks., Municipal Bldg., rectangular rein.-con. sewer in Hertel Ave. between Military Rd. and Foundry St. W. Rathman, city engr.

N. Y., Long Island City—Feb. 9, by G. U. Harvey, pres. Queens Boro., Queens Subway Bldg., sanitary sewers in 45th Dr., 45th Rd., Bell Blvd., 48th, 50th, 53rd, 56th, 202nd, 203d, 204th, 205th, 206th, 207th, Oceania, 211th Sts.; 48th, 50th, 56th, 45th, 146th Aves.

N. Y., New Paltz — Feb. 24, at office Dpt. Educ., F. P. Graves, comr., Education Bldg., Albany, sewers and water lines at New Paltz State Normal School; adv. E. N.-R. Feb. 5.

N. Y., Spencerport—Feb. 19, by Village Bd., Village Bldg., sanitary sewerage system and sewage treatment works. William S. Lozier, Inc., 10 Gibbs St., Rochester, consult. engrs.; adv. E. N.-R. Feb. 5. Noted Sept. 18.

N. Y., Yonkers—Feb. 13, by Westchester Co. Sanitary Sewer Comn., E. S. Martin, secy., Court House Annex, White Plains, 2.2 mi. 72- to 78-in. precast rein.-con. sewer, Sect. O, Sawmill Project; adv. E. N.-R. Feb. 5.

Pa., Pottstown—Feb. 24, by S. H. Porter, boro pres., sewage disposal plant. $500,000. W. H. Dechant & Sons, 632 Washington St., Reading, engrs.

Wash., Seattle—Bd. P. Wks., bids about Feb. 26, Charlestown St. unit of Lake Washington Intercepting Sewerage System, incl. 3 pumping stations, 20,000 ft. 8- to 24-in. triple strength vitr. clay pipe. $180,000. R. H. Thomson, city engr. Noted Jan. 15.

Ont., Hamilton—See "Contracts Awarded."

Ont., Ottawa — Secretary Bd. Control bids about Mar. 1 (2nd unit) sewer relief system. $400,000. A. F. Macallum, City Hall, engr.

CONTRACTS AWARDED

Calif., Los Angeles—Los Angeles Co. Sanitation Dist. 2, for Downey-Bellflower Trunk Sewer, 4 mi. 21 and 24 in. pipe, force account, under supervision A. K. Warren, engr., 139 North Bway. $125,000.

Calif., Modesto—Sewers in industrial section, day labor, under supervision F. J. Rossi, city engr. $16,000. Total $55,000. Noted Jan. 1.

Mass., Boston—City, Dpt. P. Wks., sewerage works in Buchanan Rd., West Roxbury, to N. Sannella & Son, 74 Moraine St., Jamaica Plain, $33,867.

Mass., Framingham—Town, sewer drains, day labor. $25,000. S. Dyer, Town Hall, city engr.

Mass., Woburn—City, supt. P. Wks., City Hall, Aberjona Valley Sewer, to Federico & Susi Co., 43 Westwood St., Dorchester. Est. $25,000. Noted Dec. 4.

Mich., Detroit—Dpt. P. Wks., 2,279 ft. monolithic concrete sewer in tunnel, 4 ft. 9 in., 4 ft. cylinder and 920 ft. 2 ft. 8 in. x 4 ft. egg section liner plates, brick, concrete manholes in Hessel Ave. Arm extension east of Asbury Park, from Asbury Park to Winthrop Aves., to Contractors, Inc., 12901 Lyndon Ave., $25,000.

N. Y., Freeport—Bd. Sewer Comrs., Municipal Bldg., 46 North Ocean Ave., sanitary sewers for Lateral Sewer Dist. 2, to Spinello Constr. Co., 437 Riverside Ave., Newark, N. J., $174,-685. Noted Jan. 1.

N. Y., Rochester—Common Council, sanitary sewers in Chesterfield Dr., Tupper St., Denise Rd., to A. Petrossi, 68 Main St. W., $106,126. Noted Dec. 25.

Tex., Houston—Storm sewers necessary for paving Lowell St., to R. Mitchell, Petroleum Bldg., $43,223. Est. $45,000.

Wis., Milwaukee — Sewerage Comn., general contract 1 story, 38 x 62 ft., concrete, brick, steel return sludge pumping station, Jones Island, to S. M. Siesel Co., 514 East Ogden St., $43,881. Noted Jan. 8.

Ont., Brampton—C. M. Corbett, town clk., 9,500 ft. 15 to 36-in. trunk sewers, and 4,200 ft. 10-to 12-in. laterals, concrete and vitr. clay pipe, to Ruscica Bros., 84 Woodycrest Ave., Toronto. Est. $50,000.

Ont., Hamilton—City Council, 8 in. vitr. tile storm and sanitary sewer in Concession St., day labor, under supervision of W. L. McFaul, engr., City Hall. $56,580. Noted Dec. 18.

STREETS AND ROADS

BIDS ASKED

Alabama—Mar. 4, by L. G. Smith, hy. dir., Montgomery, **(F.A.P. means Federal Aid Project)**, concrete, sheet, rock asphalt or bit. concrete paving 11.26 mi. Bay Minette and Stapleton Rds., F. A. P. 893A-1—17.28 mi. Robertsdale and Pensacola Rd., F. A. P. 184, both Baldwin Co. — 2 mi. F. A. P. 25 reopened, Morgan Co.—11 mi. hy. in Tuscumbia, west, F. A. P. 196-B, Colbert Co.—concrete or bit. concrete paving 12.5 mi. Huntsville-Athens Rd., F. A. P. 171, Madison and Lawrence Counties — paving 6 mi. Guin-Hamilton Rd., F. A. P. 173-A, Marion Co.—12 mi. Stapleton-Mobile Bay Rd., F. A. P. 221-229-A, Baldwin Co. — grading, draining 7.373 mi. Tuskegee-Auburn Rd., F. A. P. 201, Macon Co.—2.95 mi. Georgiana-Greenville Rd., F. A. P. 244, Butler Co.—10.708 mi. Tuskegee-Auburn Rd., F. A. P. 228, Macon and Lee Counties.

California—Feb. 11, by State Hy. Comn., Sacramento, grading, oil treated crushed gravel or stone surfacing 29.2 mi. road between point 1½ mi. east of Essex and point 1 mi. southeast of Klinefelter, San Bernardino Co. C. H. Purcell, hy. engr.

California — Feb. 18, by State Hy. Comn., Sacramento, grading, concrete surfacing 7.7 mi. road between Stockton and point 0.5 mi. north Houston School, San Joaquin Co. C. H. Purcell, hy. engr.

Calif., Culver City—Feb. 16, by City Council, curbing, grading 1,620,000 sq.ft., 2 in. warrenite on 6 in. asphaltic concrete paving, 470,000 sq.ft., 2 in warrenite on 6 in. concrete surfacing, 428,-000 sq.ft. Sepulveda Blvd., between Venice Blvd. and city limits.

Calif., Los Angeles—Bd. P. Wks., City Hall, rejected bids grading, curbing, sidewalks, 6 in. concrete paving 215,060 sq.ft. Yorkshire Dr. and Parish Avenue Impvt. Dist. Will readvertise.

Calif., Stockton — Feb. 16, by E. Graham, clk. San Joaquin Co., improving Farmington-Bellota Rd., incl. 18,500 cu.yd. grading, 11,500 tons base course, 1,060 tons crushed rock, 470 tons rock chips, 385 tons pea gravel, 252 bbl. and 112 tons asphaltic oil. To exceed $30,000.

Ill., Robinson—Feb. 26, at office Clerk Crawford Co., traffic bound gravel surfacing 22,879 ft. State Aid Route 14, Sect. 2, 22 ft. wide with two 6 ft. earth shoulders—gravel surfacing 10,-300 ft. State Aid Route 13, Sect. 3—5,100 ft. State Aid Route, Sect. 3-W, both 18 ft. wide with two 6 ft. shoulders. L. F. Walker, Robinson, co. supt. hys.

Ind., Ft. Wayne — Feb. 24, by Bd. Comrs. Allen Co., at office F. M. Ortlieb, aud., concrete surfacing 15.03 mi. Monroeville Rd., Marion, Madison and Monroe Twps. $344,507.

La., New Orleans—Feb. 10, by City Council, sub-surface drainage system, concrete sidewalks, concrete and various types paving 1,350 ft. Pine St. from Broad Pl. to Colapissa St.—1,640 ft. Poydras St. from Clairborne to Galvez Sts.—1,140 ft. North Front St. from Canal to Conti Sts.—1,295 ft. Dreaux Ave. from Franklin to Peoples Aves.—driveways, drainage structures, curbing, various types paving 2nd St. from La Salle to South Clairborne Sts.—2,750 ft. 2nd St. from St. Charles Ave. to La Salle St.—3,745 ft. Montegut St. from St. Claude to North Galvez Aves.—5,215 ft. Jena St. from Magazine to Frerot Sts.—1,535 ft. Jackson Ave. from Clairborne St. to South Galvez Aves.—3,350 ft. North Galvez St. from St. Bernard Ave. to Elysian Fields—1,915 ft. Jackson Ave. from Baronne to La Salle Sts.—2,715 ft. Zimple St. from Bway. to Carrollton Sts.—2,250 ft. concrete sidewalks and driveways North Galvez St. from St. Bernard Ave. to Elysian Fields—3,762 ft. Liberty St. from Napoleon Ave. to Arabella St.—5,215 ft. Jena St. from Magazine to Forest Sts.—gravel or shell surfacing 1.5 mi. Mirabeau Ave. from Paris to Anette Sts. — sub-surface drains, culverts, manholes, catch basins, cleanouts, concrete sidewalks 2,990 ft. 2nd St. from La Salle to South Clairborne Sts.—3,350 ft. North Galvez St. from St. Bernard Ave. to Elysian Fields—1,535 ft. Jackson Ave. from South Clairborne Ave. to South Galvez St.—2,750 ft. 2nd St. from St. Charles Ave. to La Salle St.—3,745 ft. Montegut St. from St. Claude to North Galvez Aves.—1,585 ft. Jackson Ave. from Frerot St. to South Clairborne Ave.—2,715 ft. Zimple St. from Bway. to Carrollton Sts.—5,215 ft. Jena St. from Magazine to Frerot Sts., 1,915 ft. Jackson Ave. from Baronne to La Salle Sts.—2,500 ft. Broad Pl. from Fountainbleau Dr. to Loverline St.

Maryland—Feb. 10, by State Roads Comn., Baltimore, G. C. Uhl, chn., concrete paving 6.4 mi. Contr. CI-89-54F-156-54, Federal Aid Project 156E, Carroll and Frederick Counties—1.91 mi. Contr. D-69-14, Federal Aid Project 222, Dorchester Co. — 2.93 mi. Contr. Wi-64-14, Federal Aid Project 228, Wicomico Co.

Md., Baltimore—Feb. 11, by Bd. Awards, concrete paving 11,100 sq.yd. streets listed in Contr. 578; sheet asphalt paving 10,000 sq.yd. streets listed in Contr. 577. N. L. Smith, Municipal Bldg., hys. engr.

Michigan—Feb. 10, at office Village Clerk, Clinton, grading, shaping, drainage structures, concrete paving 5.068 mi. MO46-18, Contr. 1, 20 ft., Lenawee Co., for State Hy. Comn., Lansing. R. R. Havens, Jackson, resident engr.

Michigan — Feb. 11, at office City Clerk, Muskegon, shaping, concrete paving 1.592 mi. FO61-11C-5 and MO61-11C-6 (city of Muskegon), 20 and 40 ft., for State Hy. Comn., Lansing. H. C. Fleming, Grand Rapids, resident engr.

Michigan—Feb. 12, by H. C. Fleming, resident engr., Watson Bldg., Grand Rapids, grading, shaping, drainage structures 6.359 mi. MO61-27 Contr. 1, Muskegon Co., for State Hy. Comn., Lansing.

Mississippi — Feb. 11, by State Hy. Comn., Jackson, **(F.A.P. means Federal Aid Project)**, clearing, grubbing, grading, drainage structures, Bermuda sodding 0.661 mi. Laurel-Collins Rd., F.A.P. 207-C, Jones and Covington Counties, also bridges over 20 ft. span, incl. 91,920 lb. reinforcing, 189,370 lb. structural steel, 3,351 lin.ft. foundation piling, 842 lin.ft. handrailing —7.59 mi. Union-Decatur Rd., F.A.P. 74-F, Newton Co., also bridges over 20 ft. span, incl. 83,956 lb. reinforcing and 27,230 lb. structural steel, 1,764 lin.ft. foundation piling, 490 lin.ft. handrailing — 2.11 mi. Kosciusko-Durant Rd., F.A.P. 191-B, Attala and Holmes Counties, also bridges over 20 ft. span, incl. 256,120 lb. reinforcing and 756,550 lb. structural steel, 7,388 lin.ft. concrete, 1,190 lin.ft. creosoted piling, 4,018 ft. b.m. creosoted lumber, 3,980 lin.ft. handrailing — 3.578 mi. Laurel-Collins Rd., F.A.P. 207-B, Jones Co., also bridges over 20 ft. span, incl. 116,073 lb. reinforcing and 184,-610 lb. structural steel, 4,932 lin.ft. foundation piling, 953 lin.ft. handrailing — 3.782 mi. Meridian-Russell Rd., F.A.P. 210-A, Lauderdale Co., also bridges over 20 ft. span, incl. 61,597 lb. reinforcing steel, 1,050 lin.ft. foundation piling, 130 lin.ft. handrailing. C. M. Williamson, dir.

Montana — Feb. 26, by State Hy. Comn., Helena, grading, graveling roads: Mar. 26, grading, graveling roads. R. D. Rader, state hy. engr.

Mont., Miles City—Mar. 23, by City, curbing, guttering, sewer, paving 74,380 cu.yd. J. Hall, city engr.

New Jersey—Feb. 16, by State Hy. Comn., Trenton, grading, 8 in. single line rein.-con. paving 151,171 sq.yd. Route 42, Sect. 6, Weymouth-McKee City Rd., Atlantic Co. A. L. Grover, ch. engr.; adv. E. N.-R. Feb. 5.

N. J., Maplewood—Feb. 9, by Bd. Freeholders Essex Co., Court House, Newark, curbing, guttering, sheet asphalt on 6 in. concrete paving Irvington Ave. $25,000. W. Stickles, Court House, Newark, co. engr.

N. Y., Buffalo—Feb. 11, by G. Fisk, comr. P. Wks., Municipal Bldg., repaving Sessions Ave., Hoyt, Staats, Wilkeson, Tonawanda Sts.; filling in land for proposed park approach on south westerly side of Cazenova Creek Channel between South Park Ave. and Cazenovia St. W. Rathman, city engr.

N. Y., St. George—Feb. 11, by J. A. Lynch, pres. Richmond Boro, Boro Hall, grading, bituminous macadam paving Mundy Ave., grading Brabant St.

North Carolina—Feb. 10, by State Hy. Comn., Raleigh, **(P. means Project)**, grading, concrete or asphaltic paving 4.89 mi. P. 7717, Watauga

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Streets and Roads (Continued)

Co., $100,800—6.24 mi. P. 6831, Stanly Co., $126,700—13.22 mi. P. 5753, Moore Co., $260,200—6.61 mi. P. 4821, Wake Co., $34,400—5.68 mi. P. 3631, Onslow Co., $85,100—4.45 mi. P. 3332, Columbus Co., $76,400—15 mi. P. 3072, Bladen Co., $254,700 — 9.46 mi. P. 2450, Jones Co., $112,700—5.55 mi. P. 2051, Craven Co., $115,700—8.31 mi. P. 1340, Gates Co., $142,600—7.98 mi. P. 1142, Martin Co., $136,300. J. D. Waldrop, Raleigh, engr.

Oklahoma—State Hy. Dpt., Oklahoma City, rejected bids grading, drainage structures Federal Aid Project 774-A, Stephens Co. $30,000. A. R. Losh, hy. engr.

Okla., Tulsa—Feb. 13, by E. Logan, city aud., grading, drainage structures, 7 in. concrete paving 2,319 sq.yd. Delaware St. $25,000; 3,690 sq.yd. Victor St. $25,000. H. A. Parker, City Hall, engr.

Okla., Tulsa—Feb. 13, by Bd. Comrs. Tulsa Co., E. Logan, aud., (**S.I.D. means Street Impvt. Dist.**) curbing, sewers, grading, drainage structures Class F, 7 in. concrete paving 1,788 sq.yd. S.I.D. 1070, Delaware Ave. $6,360—2,713 sq.yd. S.I.D. 1071, Main St., $10,042—3,689 sq.yd. S.I.D. 1072, Victor Ave., $13,690—921 sq.yd. S.I.D. 1074, Boston Pl. $11,333. H. A. Parker, Municipal Bldg., engr.

Pa., McKees Rocks—Feb. 16, by J. W. McLaughlin, secy. Bd. Comrs. Stowe Twp., Municipal Bldg., curbing, storm and sanitary sewers, paving 10,000 sq.yd. Bway. Ave. from McKees Rocks-Stowe Twp. line to 11th St. $60,000. G. H. McGinness, Singer and Dohrman Sts., Pittsburgh, engrs.

South Carolina—Feb. 10, by State Hy. Dpt., Columbia, grading, concrete paving 9.45 mi. Route 57, Marion Co. Former contract rescinded. Noted Jan. 15, under "Contracts Awarded."

Tennessee—Feb. 13, by State Dpt. Hys. & P. Wks., Nashville (**S.A.P. means State Aid Project**), grading, drainage structures 1.15 mi. approaches Tennessee River Bridge, Dayton-Decatur Rd., Special Bridge Project 18-B, Rhea and Meigs Counties—3.474 mi. Whitehaven-Parkway Rd., S.A.P. 558-A, Shelby Co., incl. 4 bridges over 20 ft. span—9.432 mi. Coffee County Line Rd., S.A.P. 543-B, incl. 5 bridges over 20 ft. span—3.788 mi. Woodbury Rd., S.A.P. 543-D, both Cannon Co. R. H. Baker, hy. engr.

Tennessee—Feb. 20, by State Dpt. Hys. & P. Wks., Nashville, (**F.A.P. means Federal Aid Project**), surfacing 3.84 mi. Daisy-Soddy Rd., F.A.P. 231-D, Hamilton Co.—9.565 mi. Wrigley-Centerville Rd., F.A.P. 236-E, Hickman Co.—10.834 mi. Washington-Virginia State Line Rd., F.A.P. 237-B, Sullivan Co.—grading, drainage structures 4.08 mi. Clarksville-St. Bethlehem Rd., F.A.P. 238-A, Montgomery Co., also bridge over Red River—7.016 mi. Yellow Creek-Lone Oak Rd., F.A.P. 238-B, Montgomery Co., incl. 2 bridges over 20 ft. span—3.6 mi. Ducktown-Copper Hill Rd., F.A.P. 247-B, Polk Co., also two bridges over 20 ft. span—3.35 mi. Blount County Line-Delozions Store Rd., F.A.P. 250-A, Sevier Co.—5.598 mi. Spencer-Rocky River Rd., F.A.P. 252-A, Van Buren Co., incl. 2 bridges over 20 ft. span. R. H. Baker, hy. engr.

Tex., Houston—Feb. 11, by City, c/o W. E. Monteith, mayor and Harris Co., c/o H. L. Washburn, aud., 2 in. asphalt on 6 in. concrete paving Lyons Ave. from Gregg to Deepwater Sts. $175,000. J. M. Nagle and C. R. Haile, Houston, engrs.

Wash., Yakima—Comrs. Yakima Co., bids about Feb. 26, paving 2 mi. South 16th Ave. from Tieton Dr. to County Airport, 20 ft., $43,000. O. E. Brashears, Yakima, co. engr.

Wisconsin—Feb. 10, by State and Trempealeau Co. Hy. Comns., Batavian Natl. Bank Bldg., LaCrosse, grading, concrete paving 1.5 mi. Galesville-LaCrosse Rd., U. S. Hy. 53, S. A. P. 5178; Beaver Creek Bridge, 600 ft. long, concrete, steel, on U. S. Hy. 53, S. A. P. 5178.

B. C., Burnaby—See "Contracts Awarded."

Ontario—Feb. 16, by R. M. Smith, deputy minister Dpt. Hys., Parliament Bldgs., Toronto, concrete paving 7 mi. Belle River Hy. W., Contr. 31-03—4 mi. Dresden Hy. N., Contr. 31-04—5 mi. Morpeth Hy. N., Contr. 31-05—4 mi. Exeter Hy. S., Contr. 31-06—8 mi. Kennicott Hy. N., Contr. 31-07—7 mi. Walkerton Hy. W., Contr. 31-09—5.5 mi. Arthur Hy. W., Contr. 31-10—6 mi. Orangeville Hy. W., Contr. 31-11—7 mi. Barrie Hy. N. and W., Contr. 31-13 — 5 mi. Omemee Hy. E., Contr. 31-14—mixed macadam paving 7 mi. Canboro Hy. W., Contr. 31-16—6 mi. Guelph Hy. E., Contr. 31-17—6 mi. Smiths Falls Hy. S., Contr. 31-18—6 mi. by. Ashton to Carleton Pl., Contr. 31-19—mixed macadam or concrete paving 8 mi. Mount Forest Hy. N., Contr. 31-08—5 mi. Orillia Hy. S., Contr. 31-12—7 mi. Mount Elgin Hy. N., Contr. 31-15—7 mi. Mount Elgin Hy. N., Contr. 31-20—8 mi. Mount Forest Hy. N., Contr. 31-21 — 5 mi. Orillia Hy. S., Contr. 31-22—grading, culverts, 8 mi. hy. from Wingham to Teeswater, Contr. 31-23—14 mi. hy. from Stirling to Marmora, Contr. 31-24 — bridge Fairchild Creek east of Cainsville, Contr. 31-25 — L'Orignal overhead bridge, Contr. 31-26 — bridge at Kincardine, Contr. 3127—bridge at St. Ann, incl. grading

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diversion, Contr. 31-28 — Greenwood Bridge, Contr. 31-29—bridge west of Troy, Contr. 31-30. $2,250,000. A. A. Smith, Parliament Bldgs., Toronto, ch. engr.

Quebec—Chief Engineer Road Dpt., Parliament Bldgs., Quebec, bids in March, grading, culverts, fences, 2 overpasses on Canadian National Ry. tracks, concrete paving 10.5 mi. hy., from St. Hyacinthe to St. Hilaire, 34 ft. $250,000.

CONTRACTS AWARDED

Arizona—State Hy. Comn., Phoenix, improving 8 mi. Yuma-Wellton Hy., F.A.P. 26-D-Reopened, to Western Gunite Co., 110 South 3rd Ave., Phoenix, $26,398.

Calif., Los Angeles—Bd. P. Wks., City Hall, grading, curbing, guttering, sidewalks, concrete surfacing Santa Barbara Ave., between Bway. Pl. and Figueroa St., to Southern California Roads Co., 530 West 6th St., $34,565. Noted Jan. 8.

Calif., Riverside—Riverside Co., grading, culverts, Durite asphaltic concrete paving 155,345 sq.ft. Beaumont Ave., to Hall-Johnson Co., 905 Westminster St., Alhambra, $28,576.

Calif., Menlo Park—F. Kurtz, city clk., curbing, guttering, grading, emulsified macadam surfacing 670,000 sq.ft. College Ave., et al., to C. W. Wood, P. O. Box 1435, Stockton, $90,028. Noted Jan. 8.

Fla., Miami Beach — Ocean Beach' Heights Corp., curbing, guttering bituminous on rock surfacing 4,500 lin.ft. road, 130 ft. wide, incl. parkways in center in connection with 200 acre development at 98th St. to Bakers Haulover, to R. G. Lassiter Co., Southwest 27th Ave., Miami, $100,000.

Idaho — R. H. Shoemaker, acting comr. P. Wks., Boise, grading, drainage structures, rock surfacing 1.984 mi. Payette Hy. from Cascade North, Valley Co., to Triangle Constr. Co., 1220 Ide St., Spokane, Wash., $26,822. Est. $25,193.

Ill., Chicago—Bd. Local Impvts., City Hall, to Paramount Constr. Co., 82 West Washington St., grading, 7 in. concrete paving 1 alley, $6,068—to J. Dillon & Co., 2933 South Halstead St., East and West Alley $1,173, grading, sewers, 7 in. concrete paving 79th St. Alley, $5,798—to R. R. Anderson Co., 625 North Kedzie Ave., grading, curbing, guttering, sewers, 8 in. concrete paving Barry Ave. $27,720; Henderson St. $12,285—to Marquette Constr. Co., 5726 North Winchester St., East Lake Terrace and Rogers Ave. $95,088—to Chicago Constr. Co., 228 North La Salle St., removing old curbing, paving, and grading, curbing, guttering, sewers, 10 in. concrete paving North Dearborn St. $83,591—to J. A. Ross & Co., 4561 Armitage Ave., North Nagle Ave., Haft and Hermoine Sts. $49,137—to American Asphalt Paving Co., 133 West Washington St., grading, curbing, guttering, sewers, asphalt on 6 in. concrete paving East 98th Pl. $16,895—to Barber Paving Co., 7 South Dearborn St., removing curbing, masonry, pavement, grading, curbing, guttering, sewers, asphalt on 6 in. concrete paving Clifton Ave., $5,976; McClurg Court $32,120; West 66th St., West 65th and West 66th Places, South Hamlin and South Lawndale Aves. $186,402. Grand total $522,254.

Ill., Chicago—Bd. Comrs. Cook Co., County Bldg., to Allied Constr. Co., Inc., 80 East Jackson Blvd., paving 23,757 sq.yd. 55th St. $43,825, 29,191 sq.yd. Forest Reserve Rd. $51,493, 33,424 sq.yd. Indiana Ave. $73,422, 20,368 sq.yd. Lake Ave. $71,339, 56,044 sq.yd. 87th St. $139,639—to Pickus Eng. & Constr. Co., 38 South Dearborn St., 45,008 sq.yd. Harlem Ave. $84,387, 42,416 sq.yd. Oakton St. $82,251, 59,283 sq.yd. Wolf Rd. $121,424—to Milburn Bros., Rockford, 14,162 sq.yd. River Rd. $56,008. Grand total $723,788. Noted Jan. 1.

Indiana—State Hy. Comn., Indianapolis, grading, drainage structures concrete surfacing 6.529 mi. Rd. 54, Greene Co., to J. J. Quinn & Co., Bedford, $152,579 est. $172,200; 7.878 mi. Rd. 1, Franklin Co., to Globe Constr. Co., 2307 West Franklin St., Evansville, $176,959 est. $199,270. Noted Nov. 6.

Iowa — State Hy. Comn., Ames, grading, drainage structures 6.768 mi. Mahaska Co., to Elarton & Elliott, Bussey, $59,766—10.599 mi. Pottawattamie Co., to G. W. Condon Co., Grain Exch. Bldg., Omaha, Neb., $62,232—gravel surfacing 6.661 mi. Wayne Co., to Harvey Sand & Gravel Co., Harvey, $16,760—1,000,000 ft. cable guard rail, 4,440 anchors various counties, Dist. 4, to Craig Constr. Co., 1431 41st St., Des Moines, $337,712. Grand total $476,470. Noted Jan. 15.

Kansas—State Hy. Comn., Court House, Ness City, (**P. means Project and F.A.P. Federal Aid Project**) to A. L. Cook, Ottawa, gravel surfacing 5.605 mi. P.160-13, F.A.P.411-A $5,818; 6.351 mi. P.160-13, F.A.P.411-B $6,531, both Clark Co.—to Yant Constr. Co., 905 Omaha Natl. Bank Bldg., Omaha, Neb., 18.845 mi. P.96-9, F.A.P. 279-B $22,999, sand clay surfacing 11.772 mi. P.96-10 F.A.P.398-C $14,341, 5.205 mi. P.96-10, F.A.P.398-D $6,371, all Ness Co.—to D. H. Hardman, Alton, 17.312 mi. P.54-11, F.A.P.427-B Ford Co. $17,139, 16.019 mi. P.961-1,K-1141 Greeley Co. $11,533—to F. Eberhardy Paving Co., Salina, 10.226 mi. P.96-2, F.A.P.387-A Greeley Co. $6,105—to Geiger & Rutherford Leavenworth, grading, concrete surfacing 0.7 mi. Leavenworth Co., $46,126. Grand total $136,963. Noted Jan. 1.

Kentucky—State Hy. Dpt., Frankfort, to N. E. Stone & Co., Madisonville, rein.-con. surfacing 1.468 mi. roads in Fulton Co. $26,541; 3.351 mi. Hickman Co. $60,016; gravel surfacing 9.406 mi. Hickman Co. $22,831—to Ashland Supply Co., Ashland, grading, drainage structures, traffic bound limestone surfacing 1.3 mi. bridge approaches, Clark and Madison Counties $45,136—to Berry & Kelly, Louisville, 0.8 mi. bridge approaches Pulaski Co. $67,466—to Duke Bros., Hartford, grading, drainage structures curbing, guttering 0.56 mi. Main St. of Clay, Webster Co. $9,558—to Hart & Hart, Owensboro, raising fills, extending, building 1.321 mi. overflow drainage structures Hickman Co. $31,224—to North Fork Constr. Co., Jackson, grading, drainage structures, using 1st class pipe, 3.958 mi. Washington Co. $35,749—to Vincennes Bridge Co., Vincennes, Ind., steel superstructure for bridge over O'Bion Creek, Hickman Co. $6,843. Grand total $321,738. Noted July 10, Nov. 6 and Dec. 4.

La., Winnfield — Grading, curbing, concrete paving 1 mi. Bevil and Lafayette Sts., to Roberts Paving Co., Salisbury, Md., $21,525.

Md., Baltimore—Bd. Awards, concrete paving 8,800 sq.yd. streets listed in Contr. 571, to Baltimore Asphalt Block & Tile Co., 1320 North Monroe St., $36,456; concrete paving 10,050 sq.yd. streets listed in Contr. 572, to Aiello Contg. Co., Gough and Dean Sts., $20,788.

Mass., Waltham—Bituminous macadam paving Marlboro St., to Bell Bros., 110 High St. Est. $25,000.

Michigan—R. R. Havens, resident engr., Jackson, grading, drainage structures 1.638 mi. FO38-27C-4, village of Concord, Jackson Co., to R. P. Parham, Bronson, for State Hy. Comn., Lansing, $30,317. Noted Dec. 4.

Michigan—At office J. T. Sharpensteen, div. engr., Escanaba, grading, shaping, drainage structures, concrete paving 0.322 mi. MO21-6, Contr. 10 (city of Escanaba), Delta Co., to L. W. Brumm, Marquette, for State Hy. Comn., Lansing, $29,367, incl. cement. Noted Jan. 8.

Montana—State Hy. Comn., Helena, crushed graveling 15.161 mi. Lake Co., to Poston Bros. & Hassman, Trego, $57,450—7.281 mi., Liberty Co., to Syster & Rathburn, Shelby, $36,320—9.08 mi. Wheatland and Golden Valley Counties, to J. L. McLaughlin, Livingston, $26,406 — 14.563 mi., Custer Co., to Larson-Erling Co., Sioux Falls, S. D., $45,616 — 25.813 mi., Chouteau and Cascade Counties, to H. Pickus Constr. Co., 3rd and Plymouth Sts., Sioux City, Ia., $116,112—22.393 mi., Roosevelt Co., to Hall & Booth, Stanley, N. D., $138,817—4.528 mi., Missoula Co., to J. C. O'Connor, Butte, $56,267—36.556 mi., Beaverhead Co., to Morrison Knudson Co., Boise, Idaho, $227,290—grading, drainage 9.246 mi., Petroleum Co., to J. C. McGuire, Butte, $112,643—23.791 mi., Carbon Co., to S. J. Groves & Sons Co., 529 South 7th St., Minneapolis, Minn., $15,076—9.474 mi., Jefferson Co., to E. C. Powell, Craig, $112,623. Grand total $944,620. Noted Jan. 19.

New Jersey—State Hy. Comn., Trenton, 9 in. single line rein.-con. paving 0.58 mi. Route 23, Sects. 6A, 7A, and 7B, near Newfoundland, Sussex and Passaic Counties, to Culp Constr. Co., Dover, $47,365. Noted Jan. 1.

N. Y., Brooklyn—H. Hesterberg, pres. Brooklyn Boro, Boro Hall, to M. J. O'Hara, Neptune Ave. and West 19th St., asphalt paving East 48th St. $6,813—to Brooklyn Alcatraz Asphalt Co., 407 Hamilton Ave., 53rd St. $7,069; 12th Ave. $3,753; 62nd St., $2,984. Grand total, $20,619. Noted Jan. 8.

N. Y., Hamburg—New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., New York, concrete paving in connection with Athol Springs Rd. Grade Crossing, to Meyer & Meyer Corp., Depew, $37,758. Est. $48,278.

O., Cincinnati—C. A. Dykstra, city mgr., City Hall, granite curbing, cement sidewalks, concrete paving 6,000 sq.yd. Beekman St. from Queen City to Fairmount Aves., to August J. Henkel Constr. Co., 604 Vine St., $19,565. Est. $27,420. Noted Jan. 8.

Okla., Oklahoma City—City Council, grading, paving 22 blocks in Crown Heights Addition, 30 ft., to Connelly Bros., El Reno, $63,098. Est. $75,000.

Okla., Tulsa—City Comn., E. Logan, aud., grading, curbing, guttering, sewers, Class F 7 in. concrete paving 3,934 sq.yd. Delaware Pl., Street Impvt. Dist. 1068, to H. L. Cannady Co., 1116 South Lewis St., $15,804. Est. $16,022. All bids rejected improving 5,402 sq.yd. 13th St., Street Impvt. Dist. 1069. Project abandoned for present. Noted Jan. 8.

Oregon—State Hy. Comn., Salem, grading, surfacing 17.65 mi. Crater Lake Hy., Jackson Co., to Interstate Constr. Co., Portland, $135,443—32.2 mi. Columbia River Hy., Multnomah Co., to West Contg. Co., Portland Ave., Portland, $66,848—5.47 mi. McKenzie Hy., Lane Co., to Fred Christensen, Inc., 187 East 34th St., Portland, $55,840. Grand total, $258,131. Noted Jan. 8.

Streets and Roads (Continued)

Pa., Pittsburgh—Allegheny Co. grading, Class A concrete paving 9,300 ft. Elwyn Rd., 20 ft., to A. R. Ferguson, Versailles Ave., McKeesport, $119,750; grading, Class C rein.-con. paving 471 ft. Center St. in West View Boro, 24 ft., to A. C. Brotmarkle, 2219 Brownsville Rd., $7,144.

South Carolina—State Hy. Dpt., Columbia, to Pennell & Harley, Inc., Spartanburg, cement paving 19.9 mi. Route 284, Greenville Co., $407,873; 12.1 mi. Route 64, Colleton Co., $228,947; 8.7 mi. Route 7, Greenwood and Laurens Counties, $121,301—to H. E. Wolfe Constr. Co., St. Augustine, Fla., 21.4 mi. Route 3, Orangeburg and Lexington Counties, $288,617—to Carolina Contg. Co., Columbia, 16.6 mi. Routes 30 and 34, Darlington and Lee Counties, $259,052—to Louis Des Cognets, Lexington, Ky., 15.6 mi. Routes 21 and 78, Orangeburg Co., $208,687—to Simons-Mayrant Co., Charleston, 14.8 mi. Route 30, Darlington Co., $283,053—to Alley Constr. Co., Bristol, Tenn., constructing 228 ft., rein.-con. bridge, Route 183, Oconee Co., $20,934. Grand total $1,818,464. Noted Dec. 18.

Tex., Raymondville—Willacy Co., constructing hy. from Lyford to Red Fish Bay, Sebastian east, Lyford to Santa Monica, Lyford to Profiro and Lyford to Willamar, to F. P. McElwrath, Harlingen and Corsicana. Est. $400,000.

Virginia — State Hy. Dpt., Richmond, one-course macadam surfacing 3.6 mi. road in Botetourt Co., to H. Williams, Big Stone Gap, $86,344—3.92 mi. Smyth Co., to T. W. Coman, Norton, $76,742—5.604 mi. Orange Co., to Hall & Mitchell, Keswick, $96,579 — 2.181 mi. Augusta Co., to Echols Bros., Inc., Alderson, W. Va., $58,829—1.093 mi. Amherst Co., to A. N. Campbell & Co., Lynchburg, $33,881—concrete surfacing 11.888 mi. Chesterfield Co., to G. Y. Carpenter, Chester, $154,265—top-soiling 8.038 mi. Prince Edward and Lynchburg Counties, and 2.164 mi. Nottoway Co., to J. A. Marrow Constr. Co., Clarksville, $59,587 and $12,111 respectively — gravel surfacing 1.946 mi. Stafford Co., to Boatwright, Russell & Linton, Manassas, $26,784—grading, drainage structures 10 mi. Henry Co., incl. bridge over Leatherwood Creek, to N. L. Teer, Durham, N. C., $138,415 — 7.642 mi. Norfolk and Nansemond Counties, to Jamison Bros., Inc., Cotton States Bldg., Nashville, Tenn., $55,880—0.965 mi. Essex Co., to C. D. Rigsbee, Durham, N. C., $7,368. Grand total $806,794. Noted Jan. 15.

Washington—S. J. Humes, dir. State Hys., Olympia, grading 2.832 mi. Pacific Co., to Parker-Schram Co., 513-15 Couch Bldg., Portland, Ore., $52,027—1.324 mi. Douglas Co., to N. E. Degerstrom, P. O. Box 1178, Wenatchee, $17,835 — constructing Blanchard Overhead Crossing, Skagit Co., to Walesby Constr. Co., 1223 Puget Sound Bank Bldg., Tacoma, $79,688. Grand total $149,550. Noted Jan. 8.

Washington—State Hy. Comn., Tacoma, concrete paving 7.107 mi. F.A.P. 131-D, Lewis Co., to Puget Sound Bridge & Dredging Co., Central Bldg., Seattle, $135,509.

Wyoming—State Hy. Comn., Cheyenne, gravel-ing 15.5 mi. Laramie Co., to R. Spatz, Hillsdale, $11,880; surfacing 10.831 mi. Natrona and Johnson Counties, to T. J. Tobin Constr. Co., Rawlins, $56,596.

B. C., Burnaby—Grading, general road improvements, mostly by day labor, under unemployment scheme. $145,000. J. Davidson, Municipal Hall, Edmonds, engr.

Ont., Toronto—Dpt. P. Hys., Parliament Bldgs., A. A. Smith, ch. engr., grading, ditching, tile concrete culverts from Toronto limits to Wilson Ave., Cont. 31-01, to French River Constr. Co., 2 Henderson Ave., 1.4 mi. Scarboro to West Hill Rds., Contr., 31-02, to Law Constr. Co., 225 Sterling Rd. Est. $50,000.

Quebec — I. L. Boulanger, deputy Minister Dpt. Roads, Quebec, concrete paving 22 mi. Sherbrooke-Derby Line Hy., in Waterville, Ascot, Compton, Hatley, Hatley West and Stanstead municipalities, to Eastern Townships Paving & Contg. Co. Ltd., Sherbrooke $483,600. Noted Nov. 20, under "Quebec City."

SUBWAYS AND TUNNELS

BIDS ASKED

Mass., Boston—Mar. 4 (extended date), by City of Boston, Transit Dpt., 1 Beacon St., constructing Sect. A, steel, concrete traffic tunnel between Boston and East Boston. $16,000,000. Noted Jan. 29.

CONTRACTS AWARDED

Ont., Kitchener—Canadian Natl. Rys., T. T. Irving, ch. engr. (Central Region), New Union Sta., Toronto, widening concrete, steel subway under railroad tracks, Park St., to A Cope & Sons, Ltd., 19 Albert St., Hamilton. Est. $30,000. Noted Jan. 15.

WASTE DISPOSAL

CONTRACTS AWARDED

O., Cincinnati — C. A. Dykstra, city mgr., City Hall, two 2 story, rein.-con., brick incinerators, 100 ton capacity each, Dunbar Pl. and Crookshank Rd., to Pittsburgh-Des Moines Incinerator Co., Pittsburgh, Pa., $134,350.

WATERWORKS

PROPOSED WORK

Calif., Pomona—Auxiliary pumping plant for northeast section city. $3,000, equipment $2,000. F. C. Froehde, city engr.

Calif., San Francisco—Bd. Supervs., Hetch Hetchy, water pipe line across San Joaquin Valley from Oakdale Portal on east side to Tesla Portal on west, also pipe line from Telas Portal to Altamont Pass with pumping plant. M. M. O'Shaughnessey, city engr.

Colo., Colorado Springs—See "Contracts Awarded."

Ill., Peoria—Peoria Waterworks Co., R. S. Crozier, vice pres., 105 North Monroe St., 1 m.g. reservoir.

Kan., Eldorado—Postponed taking bids water filtration plant, auxiliary piping. $70,000. F. E. Schide, Eldorado, engr. Noted Jan. 8.

Kan., Olathe—For 60 m.g. impounding reservoir. E. T. Archer & Co., 619 New England Bldg., Kansas City, Mo., engrs. Noted Dec. 18.

Ky., Adairville—Preliminary surveys 2 mi. 2- to 6-in. pipe lines, 75,000-100,000 gal. elevated tank, $40,000. C. N. Harrub Eng. Co., 4th and 1st Natl. Bank Bldg., Nashville, Tenn., engrs.

Mass., Braggville (mail Milford)—Braggville Water Co., pipe line from here to Milford. $15,000 or more.

Mass., North Adams — City dam on Broad Brook watershed to impound 100 m.g. water. To exceed $15,000. H. L. Ashley, City Hall, engr.

Mass., Sandwich—Town, waterworks, incl. piping, hydrants, standpipe and pumping station. To exceed $15,000. Engineer, c/o Bd. Selectmen, to be announced at later date.

Mass., Wakefield — Town, G. A. Packard, comr., driven wells and pumping station for town's water supply. $40,000. Weston & Sampson, 14 Beacon St., Boston, engrs.

Mass., Yarmouth — Town new waterworks, incl. mains, hydrants, pumping station and tower. $75,000. Whitman & Howard, 89 Broad St., Boston, engrs. Noted Jan. 8.

Minn., Swanville—Village, J. J. McRae, clk., waterworks, $20,000. Druar & Milinowski, 904 Globe Bldg., St. Paul, engrs.

Mo., Hollister—City waterworks improvements, $29,500. Black & Veatch, 700 Mutual Bldg., Kansas City, engrs. Noted Dec. 25.

N. J., East Rutherford—Bd. City Council, Municipal Bldg., municipal waterworks, incl. reservoir, pump house, etc. $25,000 or more.

N. J., Parsippany—Parsippany Troy Hills Twp. Com., Township Hall, preliminary plans municipal waterworks, incl., sinking wells, laying 6 and 8 in. mains. $325,000.

N. J., Trenton—Hamilton Twp. Com., water system Yardville, Yardville Heights, Groveville, Lakeside Park, White Horse and Fairview Park, C. S. Sincerbeaux, Mechanic Bldg., engr.

Okla., Shawnee—Surveys new reservoir water supply. $225,000. T. E. Thompson, Shawnee, engr.

S. D., Aberdeen—City water supply, incl. filtration plant, supply main, water softening equipment. $600,000-$800,000. A. E. Bennett, city engr. Burdick & Howson, 8 South Dearborn St., Chicago, assoc. engrs.

Tex., Beaumont—City, c/o P. Millard, mgr., erecting, equipping 2 new pumping plants, remodeling old plant. $120,000. R. C. Black, city engr.

Tex., Corsicana — Preliminary plans, waterworks improvement, incl. water softening plant, dam repairs, new mains. Address City Comn.

Tex., Houston—Drilling water well at Heights sub-station. $50,000. A. J. Sauls, Water Dpt., engr.

Tex., Port Arthur—City, preliminary surveys waterworks improvements, incl. moving 50,000 g.p.m. pump and engine unit from central plant to Lakeview Station, and installing new 110,000 g.p.m. pump and engine at Central Station. W. O. Bower, city engr.

Tex., Tenaha—Soon takes bids waterworks, incl. 16,000 lin.ft. c.i. mains, pumping unit, fire plugs, etc. $35,000 voted for same. Noted Nov. 27.

W. Va., Parkersburg—Waterworks extensions, incl. reinforcing existing system of mains, $300,000. L. G. Merrill, city engr. Morris Knowles, Inc., Westinghouse Bldg., Pittsburgh, Pa., engrs.

Wis., Stevens Point—Consolidated Water Power & Paper Co., Wisconsin Rapids, 1 story, pumping station.

Ont., Meaford—Town, extending waterworks, incl. 6 in. c.i. mains, valves, hydrants, services. $25,000-$50,000. James, Proctor & Redfern, 36 Toronto St., Toronto, engrs.

Ont., Oshawa—City, increasing capacity clear water well, from 100,000 gal. to 500,000 gal. capacity, incl. 70 x 125 ft., rein.-con. addition, at pumping station. $20,000. W. C. Smith, Municipal Offices, engr.

BIDS ASKED

Calif., Healdsburg—City taking bids chlorinator for municipal water supply. A. B. Stuart, city engr.

Calif., Los Angeles—Feb. 10, by City Purchasing Agent, Atchison, Topeka & Santa Fe., 30,000 lin.ft. 8 in. bell and spigot c.i. water pipe, delivered on April 1, 30,000 lin.ft. May 1, 30,000 lin.ft. June 1, all above f.o.b. cars Hewitt St. spur, also 50,000 lin.ft. 6 in. c.i. bell and spigot, c.i. water pipe delivered Mar. 16, f.o.b. cars or trucks, Aetna and Vesper Sts., Van Nuys.

Ia., Wellsburg—Feb. 13, by G. Gerrdes, city clk., 12,000 ft. 2- to 6-in. mains. $15,000. W. E. Buell Co., 601 Insurance Exch. Bldg., Sioux City, engrs.

Me., Portland—See "Contracts Awarded."

Md., Baltimore — Feb. 18, by Bd. Awards, 14,000 ft. 84 ft. rein.-con. pressure pipe conduit for new filtration reservoir, tunnel from Mt. Vernon Pumping Station to Montebello Filtration Plant, Park Grove from Tivoly Ave. to Alameda Blvd., dry rubble back fill, electric wiring. $800,000. E. G. Rost, Municipal Bldg., water engr.

Mass., Framingham — See "Contracts Awarded."

Mass., Pembroke—Feb. 10, by Bd. Water Comrs., c/o Fay, Spofford & Thorndike, engrs., 44 School St., Boston, waterworks, Contr. 1, Item 1, 1,845 tons 6- to 10-in. standard pit cast iron bell and spigot pipe or 73,950 ft. 6- to 10-in. centrifugal bell and spigot pipe, Item 2, 25 tons 6- to 10-in. standard bell and spigot fittings, Item 3, 12 tons 6- to 10-in. standard flexible joint pipe, metropolitan type; Contr. 2, Item 1, one hundred fifty 6- to 10-in. gate valves, Item 2, 150 adjustable valve boxes; Contr. 3, 80 fire hydrants with 1 steamer nozzle and two 2½ in. hose nozzle.

Mass., Waltham—See "Contracts Awarded."

N. H., Concord—Taking bids 1 story, brick pumping station, Soucook River. $15,000 bonds. Metcalf & Eddy, Statler Bldg., Boston, Mass., engrs.

N. Y., Brentwood—Feb. 18, by Dpt. Mental Hygiene, State Office Bldg., Albany, water supply at Pilgrim State Hospital, $410,000; adv. E. N.-R. Feb. 5. Noted Dec. 8

N. Y., Maybrook—Feb. 19, by Bd. Village Trustees, T. A. Miller, clk., water system. H. W. Taylor, 11 Park Pl., New York, consult. engr.; adv. E. N.-R. Feb. 5.

N. Y., New York—Feb. 10, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., mains in Dash Pl., Eastern and Throggs Neck Blvd., Ampere, Buhre, Chesbrough, Edison, Gleason, Kearney, Waterbury, Watt, Brady, Fink, Inwood, Mayflower, and Tenbroeck Aves., Drake, Faile, Gray and Magenta Sts., Bronx Boro; mains, appurtenances, transferring taps, rearranging and settling additional valves and hydrants on existing mains in Bway., West Bway., Pike, Slip, Riverside Dr., Convent, Edgecomb, Madison, 2nd and St. Nicholas Aves., Broome, Delancey, East 3rd, East 15th, East 18th, East 19th, East 22nd, East 74th, East 84th, East 92nd, East 96th, West 23rd, West 30th, West 31st, West 33rd, West 40th, West 49th, and West 178th Sts., Manhattan Boro.

Tex., Wichita Falls—Feb. 24, by City, c/o G. D. Fairtrace, city mgr., water filtration plant, pumping station, furnishing, installing filter equipment, 2,880 ft. 14- to 24-in. c.i. pipe, raw water control manhole, preliminary mixing basin, settling basins, clear well, exterior overhead flumes, yard piping. $1,000,000. Montgomery & Ward, Snider Bldg., engrs. Black & Veatch, Mutual Bldg., Kansas City, Mo., consult. engrs.

B. C., Burnaby—See "Contracts Awarded."

Ont., Burlington—See "Contracts Awarded."

Ont., Ottawa — Secretary Bd. Control, bids about Mar. 1, water meters, $15,000; water mains, services $75,000; new pumps for Queen St. Pumping Station $56,000; new motor pumps for fire department $30,000. A. F. Macallum, City Hall, engr.

Ont., Welland—See "Contracts Awarded."

CONTRACTS AWARDED

Colo., Colorado Springs—Broadmoor Hotel Water & Power Co., c/o C. L. Tutt, 700 m.g. steel faced, rock fill dam, 100 ft. high, 600 ft. long, to E. Honnen, Colorado Springs, $360,000. Soon lets contract $160,000 worth of steel for 9 mi. pipe line.

Me., Portland—Portland Water Dist., mains in Falmouth St., etc., $15,000; in Broadway, Sawyer, School and Monroe Sts., South Portland, est. exceeds $15,000, day labor.

Mass., Framingham—Town, extending mains, curbing in connection with laying of pipe, day labor. $18,500. S. Dyer, city engr.

Mass., Waltham—Mains in Lexington, Main and Lincoln Sts., day labor. To exceed $15,000.

Minn., Monterey—Village, distribution system for waterworks, to Jacobs & Sons, Bird Island; pump, to Crane Co. of Minnesota, 5th St. and Bway., St. Paul; tank, to Pittsburgh-Des Moines Steel Co., Tuttle and 10th Sts., Des Moines, Ia., $3,500; well, to Thorpe & Co., 2340 6th St., Des Moines, Ia., $1,500. Est. $15,000. Noted Jan. 8.

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Waterworks (Continued)

Mo., Kansas City—City, 600 tons 6 in. and 200 ton 8 in. Class "C" water pipe, to National Cast Iron Pipe Co., Land Bank Bldg., $28,590 and $38,120 respectively.

Okla., Oklahoma City—City, M. Peshek, city clk., drilled well, deep well pump, distribution system at airport, to Sherman Iron Wks., 18 East Main St., $15,100. Est. $17,000.

Okla., Shawnee—City Council, 8 drilled wells, to Layne Western Co., 507 Mutual Bldg., Kansas City, Mo., $17,000.

B. C., Burnaby—E. A. Cleveland, city engr., 500 Beatty St., Vancouver, furnishing 35,600 ft. 20- to 36-in. electrically welded pipe, to Vancouver Eng. Wks., 519 6th Ave., Vancouver, $153,107; laying pipe, to Miles P. Cotton & L. M. Rawlings Co., 1386 Nicola St., Vancouver, $137,195. Noted Dec. 25.

B. C., Burnaby—General waterworks extensions, day labor under unemployment schemes. $100,000. J. Davidson, Municipal Hall, Edmonds, engr.

Ont., Burlington — Town, 4 and 6 in. c.i. watermains, day labor. $18,500. G. H. Power, Oakville, engr. Noted Jan. 15.

Ont., Toronto—City, 8,500,000 imperial gal. electric driven pump for high level pumping station, to Turbine Equipment Co. Ltd., 73 King St. W., $15,475.

UNCLASSIFIED

PROPOSED WORK

Ariz., Lowell—Lucy Bell Mining Co., J. F. Jones, mgr., mine improvements, incl. 25 ton ball mill, compressor, lighting plant and additional company houses.

Calif., Bakersfield—CREMATORY CHAPEL, etc.—Bakersfield Memorial Park, J. K. McAlpine, pres., plans by E. J. Symmes, Haberfelde Bldg., columbarium crematory, chapel, Memorial Park. To exceed $150,000.

Ind., Indianapolis—TELEPHONE LINES—Indiana Bell Telephone Co., J. F. Carroll, pres., 256 North Meridian St., construction program 1931, incl. central office equipment $800,000, exchange lines $1,076,000; toll lines $715,000.

Md., Baltimore—WALL—Pub. Impvt. Comn. approved plans ornamental walk around Druid Lake and appropriated $50,000 for same. Remainder estimated at $25,000 or $30,000 will be appropriated by Bd. Park Comrs.

Mass., Brockton—ICE HOUSES—Flagg Ice & Coal Co., 44 Main St., rebuilding 4 icehouses, recently destroyed by fire. Concord Ave. Private plans. To exceed $25,000.

Mass., Melrose (br. Boston)—COMFORT STATION — City, R. Perkins, City Hall, concrete comfort station.

N. Y., Brooklyn—COAL POCKETS—Schnabel Coal Co., Warehouse Ave. and East 24th St., coal pockets. $40,000. **Maturity in June or later.** O. J. Sambach, 51 Chamber St., New York, archt. Noted Jan. 22.

N. Y., Brooklyn—COMFORT STATION—Dpt. Parks, W. R. Herrick, pres. Park Bd., Arsenal Bldg., Central Park, plans 29 x 34 ft. comfort station, Bay Ridge, Parkway and 12th St. $40,000.

Okla., Oklahoma City—GAS PIPE LINE—Anderson-Pritchard Oil Corp., Colcord Bldg., 26,000 lin.ft. 16 in. gas pipe line in city oil field. $40,000. Private plans.

Pa., Monessen—DOCK—Pittsburgh Steel Co., Union Trust Bldg., Pittsburgh, Pa., subsidiary United Steel Corp., New York, soon takes bids general and separate contracts receiving dock. $250,000.

BIDS ASKED

N. J., Holmdel—TUNNELS—Feb. 17, by Dpt. Institutions & Agencies, State Office Bldg., Trenton, concrete tunnels connecting buildings at New Jersey State Hospital Grounds. $25,000. Division Architecture & Constr., Trenton, engrs.

N. J., Newark—LANDSCAPING—Feb. 26, by North Jersey Dist. Water Supply Com., 24 Commerce St., landscaping at Raymond Dam, Boro Wanaque, Passaic Co. N. C. Holdredge, asst. ch. engr. M. R. Sherrerd, consult. engr.; adv. E. N.-R. Feb. 5.

Tex., Corpus Christi—JAIL EQUIPMENT—Feb. 14, by Nueces Co., c/o Judge, court house annex equipment. Former bids rejected. Noted Jan. 1, under "Contracts Awarded."

CONTRACTS AWARDED

Ga., Atlanta — MARBLE and GRANITE SHEDS — B. F. Coggins & W. H. Allen, 896 Confederate Ave., 100 x 410 ft., 82 x 140 ft. and 49 x 56 ft., structural steel, and corrugated iron marble and granite sheds, Confederate Ave., to Converse Bridge & Steel Co., 2408 Vance Ave., Chattanooga, Tenn. Est. $40,000.

Mass., Beverly — STORAGE TANKS — See "Warehouses."

N. Y., New York—STATION FINISH—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., station finish, 174 175th St., Tremont Ave., 182nd-183rd Sts. and Fordham Rd. Stations, of Rapid Transit R.R., to Lynn Eng. Co., 32-01 30th Ave., Long Island City, $455,722. Noted Nov. 20.

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N. Y., New York — DOCK — M. Cosgrove, comr. Docks, Pier "A," Battery Pl., final extension battery landing platform North River, to Rhodes & Manvel, 90 West St., New York, $42,490. **Noted Jan. 15.**

Texas, Arizona and Mexico—NATURAL GAS PIPE LINE—Western Gas Co., subsidiary of El Paso Natural Gas Co., El Paso, Tex., 275 mi. 12 in. natural gas pipe line from El Paso, Tex. to Douglas and Bisbee, Ariz. and Cananea, Mex., gas pipe, to A. O. Smith Co., 27th and Keefe Sts., Milwaukee, Wis.; compressor equipment, etc., to Cooper-Bessemer Corp., 25 West 43rd St., New York. $6,000,000. Ford, Bacon & Davis, 39 Bway., New York, engrs. Stone & Webster Eng. Co., 49 Federal St., Boston, Mass., will supervise construction.

Industrial Buildings

FACTORIES AND MILLS

PROPOSED WORK

Ariz., Kingman—REDUCTION MILL, etc.—Hope Mining Co., A. Holte, pres., 85 ton capacity reduction mill and electrification underground workings.

Calif., Auburn — LIME PLANT — Auburn Chemical Lime Co. Ltd., H. T. Dyer, pres., sketches plant, near Rattlesnake Bar. **Maturity soon.**

Calif., Sacramento—ICE PLANT—Consumers Ice & Cold Storage Co., 9th and C Sts., Sacramento, sketches rein.-con. addition to refrigeration car icing plant and cold storage. $150,000.

Calif., San Jose — MANUFACTURING and REFINING PLANT — Liquid Sugar Corp., 637 Battery St., San Francisco, 3 or 4 story, concrete or brick. $100,000. Private plans.

Calif., Watsonville—CANNING PLANT—M. A. Travers, et al., Beach Rd., postponed construction 1 story, rein.-con. plant. $200,000. Noted Dec. 26.

Calif., Villa Park—PACKING PLANT—Villa Park Orchards Assn., 1 story, basement, 60 x 90 ft., rein.-con. addition. H. A. Hamm, 2145 Sacramento St., Los Angeles, engr.

Conn., Naugatuck — PLANT — Eastern Malleable Iron Co., 719 South Ave., Bridgeport, rebuilding plant, Bridge St. **$40,000 or more. Private plans.**

Ill., Kewanee—ICE PLANT—Western Illinois Ice Co., Galesburg, plans by Westerlin & Campbell, 1113 Cornelia Ave., Chicago, 1 story, part basement, 50x50x150 ft., rein.-con., brick, plain found. $60,000.

Mass., Cambridge—CLEANSING PLANT—H. J. Shea & Co., c/o W. L. Galvin, archt., 30 Brattle St., revising plans and takes bids about Feb. 10, 1 story, basement, 60 x 100 ft., brick, steel, plain found., Massachusetts Ave. opposite Ellery St. $40,000. Former bids rejected. Noted Oct. 30.

Minn., St. Paul—FERTILIZER FACTORY—See "Excavation, Drainage, Irrigation, Levees, River and Harbor."

Mo., Kansas City—DAIRY—Summe Dairy Co., 4115 East 27th St., soon takes bids brick, stone, rein.-con., plain found., 15th St. and Benton Blvd. $100,000. A. B. Fuller, 902 Orear Leslie Bldg., archt.

N. J., Carlstadt — ICE MANUFACTURING PLANT—Carlstadt Consumers Ice Co., 501-11th St., remodeling 1 story, basement, brick, steel. $40,000. Noted Jan. 8.

N. J., Jersey City — PRINTING PLANT — Jersey City Printing Co., 160 Maple St., 3 story, basement, 130 x 240 ft., brick, steel addition, Maple St. $100,000. Project in abeyance. H. D. Scudder, Jr., 9 Clinton St., Newark, archt. Noted Dec. 18.

N. J., Jersey City—PAINT FACTORY—Lowe Bros., 335 Grand St., will not rebuild 2 basement, brick, steel, Grand St. and Jersey Ave. $50,000. Project abandoned. Noted July 31.

N. J., Newark—REPAIR DEPARTMENT—Bd. Educ., City Hall Annex, revised sketches 5 story, basement, brick, steel, repair department building, Coes Pl. and Marshall St. $200,000. Noted Nov. 26 Daily.

N. J., Paterson — HOSIERY MILL — Ladies Hosiery, Inc., W. Thieman, genl. mgr., Marshall St., altering and constructing 2 story, basement, brick addition, Marshall and Dakota Sts. $40,000. Architect not selected.

N. J., Perth Amboy—DAIRY PLANT—Industrial Realty Co., c/o Ballinger & Co., 100 East 42nd St., New York, 1 and 2 story, basement, 100 x 400 ft. dairy plant. $40,000. Project in abeyance. Puritan Dairy Products Co., 683 New Brunswick Ave., lessee. Noted Dec. 11.

N. J., Plainfield—DEXTRINE PLANT—National Adhesives Corp., A. Alexander, pres., 735 West Front St., 2 story, basement, brick, steel, West St. $40,000. Project in abeyance. Noted Dec. 11.

N. J., Roselle Park—FACTORY—Fusco Br... c/o Poggi & Bragdon, archts., 275 Morris A... Elizabeth, 2 story, basement, brick, steel, Fra... lin Pl. $40,000. Project in abeyance. No... July 31.

N. J., Rutherford—CLOTHING FACTORY—Cordo, 23 West Erie Ave., will not build 2 sto... basement, brick, steel, 23 West Erie St. $4... 000. Project abandoned. F. Pirrone, 104 M... land Ave., Garfield, archt. Noted Jan. 15.

N. Y., New York — INDUSTRIAL — O... Hundred Thirty-Five East 144th Street Cor... 353 West 54th St., P. B. Williams, pres... sketches by J. M. Lake, 415 Lexington Ave., ... story industrial and light manufacturing plan... 144th St. and Walton Ave. $90,000.

N. Y., New York — MIXING BINS—Consolidated Gas Co., 4 Irving Pl., 2 steel concrete bi... 30 ft. in diam., Bronx River, Hunts Point and ... Bay Aves. $40,000. Private plans.

N. Y., New York—LIGHT MANUFACTURING—H. C. Young, 37 Murray St., plans by ... Fischer, 45 Astor Pl., light manufacturing and ... work rooms, 37 Murray St. $40,000.

O., Ashland—PUBLISHING PLANT—Ashland Times Gazette, sketches by Dickerson & Rhoades, Sloan Bldg., Cleveland, 1 story, 40 x 100 ft., brick, steel, concrete publishing plant. $40,000.

O., East Liverpool—FACTORY—Peach Porcelain Co., rebuilding 1 story, brick units porcelain factory, recently destroyed by fire, West 6th St. $75,000.

Okla., Cyril—OIL REFINERY — Anderson-Pritchard Oil Corp., Colcord Bldg., sketches additional stills for refinery. $40,000. Private plans.

Okla., Davis—GAS PLANT—General Gas Co. F. W. O'Brien, pres., sketches casinghead gas plant. $35,000. Private plans.

Okla., Oklahoma City—GAS PLANT—Anderson-Pritchard Oil Corp., Colcord Bldg., sketches casinghead gasoline plant in city oil field. $60,000. Private plans.

Okla., Okewah — PACKING PLANT — J. L. Crocker, Joplin, Mo., sketches brick packing plant, 3rd St. $150,000.

Okla., Sand Springs—COTTON BLEACHING PLANT—Commander Mills, Inc., sketches cotton bleaching plant. $72,000. G. E. Sirrine & Co., Tulsa, Okla., and Greenville, S. C., engrs.

Ore., Portland — FACTORY — Beaver Wood Products Co., S. R. Smith, pres., 1 story, 50 x 300 ft., brick, timber, 3rd Ave. near 24th St. $50,000. Private plans.

Pa., Erie—FACTORY—Erie Resistor Corp. (radio parts) H. C. Sherk, mgr., 644 West 12th St., sketches brick, steel, West 12th St. Private plans. **Maturity probably late in spring.**

Pa., Erie—LOCOMOTIVE PLANT—Heisler Locomotive Wks. G. Swabb, mgr., 316 West 16th St., sketches plant, probably brick, steel, West 16th St. Private plans.

Pa., Knox—GLASS PLANT—Monaca Glass Co., F. B. Hess, treas., brick, steel gas bottle manufacturing plant. $50,000. Private plans.

Pa., Pittsburgh—BAKERY — Haller Baking Co., 204 North Denniston Ave., plans by P. R. Scheuneman, Magee Bldg., 3 story, basement, brick, steel, 204 North Denniston Ave.

R. I., Providence—PLANT—C. Moulton Stone Co., 456 Benefit St., plans by F. E. Field, 5 Euclid Ave., 2 story, brick, timber leather finishing building plant unit, plain found., 133 Winchendon St. $50,000.

Tex., Muenster—REFINERY—Muenster Refining Co., acquired plant of Buffalo Refining Co. at Sherman, and plan moving same here. Plant will be doubled in capacity and general improvements to entire plant. $75,000. Private plans.

Tex., Fort Worth — STEEL FABRICATING PLANT—Texas Rail Joint Co., Joliet, Mo., general contract 1 story, concrete tile steel fabricating plant, machine shop and forging plant, Commerce St. N. E. and 4th Sts., to Quisle & Andrews, 2212 West 7th St. Est. $150,000.

Tex., San Angelo—PACKING PLANT—Geo. A. Hormel Co. of Texas, Fort Worth, and Avenue A and James St., San Antonio, sketches meat and poultry packing plant, incl. refrigerating facilities, killing and dressing department facilities. $75,000.

Wash., Seattle—MANUFACTURING PLANT—Weber-Rodgers Co. (merger of Rodgers Cabinet Mfg. Co., Dexter Horton Bldg., and Weber Showcase & Fixture Co., 123 Queens Anne St.), large manufacturing plant.

Ont., Brampton — PLANT — Vitamin Milling Co., 19 Melinda St., Toronto, brick, steel, concrete plant to manufacture whole wheat flour. $50,000-$60,000.

Ont., Fergus — FACTORY — Beatty Bros. sketches two 1 story, 50 x 100 ft. concrete, steel, brick additions. $100,000.

Ont., Ojibway—STEEL PLANT—Canadian Steel Corp., subsidiary United States Steel Co., 30 Church St., New York, plant additions. $60,000,000. **Maturity indefinite.**

Ont., Shelburne—FLOUR MILLS—Parker & Wilson Flour Mills, rebuilding flour mills, recently destroyed by fire. $50,000 loss.

B. C., Nootka—PLANT—Nootka Packing Co., new herring reduction plant. $75,000.

Factories and Mills (Continued)

N. S., Halifax — PLANT — Moirs Ltd. additional unit to plant. $150,000.

BIDS ASKED

Ia., Burlington—See "Contracts Awarded."

Ia., Sioux City—DAIRY PLANT—Roberts Sanitary Dairy Co., D. E. Roberts, genl. mgr., 809 Douglas St., bids about Mar. 1, 1 and 2 story 50x160 ft. and 160x175 ft., rein.-con., brick, steel, West 14th and Omaha Sts. $150,000. G. B. Hilters, 2614 Jennings St., archts. Noted Oct. 23.

N. Y., Brooklyn—CHEMICAL PLANT—See "Contracts Awarded."

Pa., Glassport—BULK PLANT—Feb. 9, by Standard Oil Co. of Pennsylvania, Peoples Gas Bldg., Pittsburgh, bulk oil storage plant, Harrison St. along Monongahela River. $75,000. Private plans.

CONTRACTS AWARDED

Calif., Los Angeles—FACTORY and WAREHOUSE—Benedict & Co. Ltd., part 1 and 2 story, rein.-con., in Manufacturing Dist., to W. P. McNeil Co., 4814 Loma Vista Ave., $300,000.

Calif., Sacramento—ICING PLANT—Consumers Ice & Cold Storage Co., 9th and L Sts., rein.-con. refrigerator car icing plant addition, to W. W. Williamson, 320 Market St., San Francisco, $150,000.

Ia., Burlington — SOAP FACTORY — Iowa Soap Co., 4 story, concrete, brick, steel addition, day labor. $75,000.

N. J., Paterson—DYE FINISHING PLANT—Associated Dyeing & Printing Corp., 35 Albina Ave., general contract 1 story, 100x175 ft., brick, steel, Pennsylvania and Kentucky Aves., to E. Reihl Co., 85 Delaware Ave. Est. $40,000 or more. Noted Jan. 15.

N. J., Elizabeth—FACTORY—Service Machine Co., 158 Miller St., general contract altering and constructing 2 story, basement, 50x160 ft., brick, steel addition, plain found., to Wilhems Constr. Co., 119 Division St. Est. $40,000.

N. J., Union City—PERFUMERY PLANT—Lockwood, Greene Engineers, Inc., 10 East 42nd St., New York, general contract 1 story, basement, 80 x 90 ft., brick, steel addition, to James Mitchell, Inc., 26 Journal Sq., Jersey City, for Yardley & Co., Ltd., 108 Palisade Ave. Est. $55,000. Noted Jan. 14.

N. Y., Brooklyn—CHEMICAL PLANT—Novocol Chemical Mfg. Co., M. Nevins, pres., 3 story chemical and drum manufacturing plant addition, day labor and separate contracts. $40,000. W. C. Lacerenza, 26 Court St., archt. Noted Jan. 22.

N. C., East Gastonia—DYEING and BLEACHING PLANT—Groves Mills, Inc., East Gastonia, cotton dyeing and bleaching plant, to A. H. Guon & Co., Spartanburg, S. C. and Gastonia. Est. $50,000.

N. Y., Brooklyn—MILK DISTRIBUTION—M. H. Renken Dairy Co., 584 Myrtle Ave., altering milk distribution station, Emerson Pl. and Myrtle Ave., to W. E. Anderson, 885 Flatbush Ave. Est. $40,000 incl. equipment.

O., Cleveland — FACTORY — Cleveland Flux Co., K. H. Baum, pres., 1026 Main Ave., 2 story, 50 x 100 ft., brick, steel, 1130 West 11th St., to A. S. Cook, 1246 Granger Rd., Lakewood. Est. $40,000.

O., Cleveland—LITHOGRAPHING PLANT—W. R. Powell, Rose Bldg., archt., 3 story, basement, 100 x 132 ft., brick, stucco, rein.-con., to Sam W. Emerson Co., 1836 Euclid Ave., for Reserve Lithographing & Printing Co., P. N. Calvert, pres., Caxton Bldg. Est. $175,000. Noted Jan. 22.

O., Middletown—PAPER BAG FACTORY—Lockwood, Greene Engineers, Inc., archts., Hanna Bldg., Cleveland, 1 story, brick, steel, to Albert M. Higley Co., Plymouth Bldg., Cleveland, for Raymond Paper Bag Co. $100,000. Noted Jan. 8.

Pa., Leechburg—CHEMICAL PLANT—Baker Findley Chemical Co., 1426 West 3rd St., Cleveland, O., 1 story, 40 x 150 ft., steel, concrete, brick, Canal St., to Vandergrift Concrete Block Co., 321 Railroad St., East Vandergrift.

Ont., Oshawa—FACTORY—Oshawa Industrial Foundation Ltd., c/o Oshawa Chamber of Commerce, 1 story, brick, concrete, steel, to T. B. Mothersill Co. Ltd., 12½ Simcoe St. S. Est. $60,000. Coulter Mfg. Co., c/o Coulter Copper & Brass Co., 155 Sumach St., Toronto, lessee. Noted Dec. 11, under "Contracts Awarded."

GARAGES

PROPOSED WORK

Ariz., Phoenix—P. Bennett, plans by Lesher & Mahoney, Phoenix, service buildings, sales rooms, gasoline and oil distribution islands. $100,000.

Ind., Evansville—National Battery Co. plans by A. E. Neucks, 606 Old State Bank Bldg., rein.-con., brick, steel, stone service building, 501 Northwest 4th St. $45,000.

Ind., Evansville—Standard Oil Co., 137 West 11th St., steel, glazed brick, terra cotta superservice station. $41,500. Private plans.

Conn., Waterbury—Kaplan Bros., 352 East Main St., revised plans by T. M. Freney, 69 Center St., and bids about Jan. 30, 1 story, basement, 50 x 110 ft., brick garage, auto service and sales building, East Main St. $40,000. Noted Jan. 8.

Mass., Waltham—Bell Bros., 110 High St., 1 story, concrete garage, storehouse, concrete found., Lexington Ave. $40,000. Private plans.

Mass., Worcester — City, Mayor's Office, City Hall, garage. $50,000 or more. Architect not selected.

N. Y., Brooklyn—R. E. W. Realty Co., Inc., 160-09 Jamaica Ave., Jamaica, sketches by M. Marle, 200 Beverly Rd., service garage, gas station, 20th Ave. and 7th St. $45,000.

N. Y., Brooklyn—A. Smith, bids late in fall, general and separate contracts 2 story, 80 x 100 ft. service garage, Stillwell Ave. and Quentin Rd. $50,000. Burke & Olsen, 32 Court St., archts. Noted Jan. 8.

N. Y., Elmhurst — Cord Meyer Co., Bway., bids about April, general contract 100 x 200 ft. service garage, Roosevelt Ave., 88th and 89th Sts. $85,000. R. Tappan, Forest Hills, archt. Noted Jan. 15.

N. Y., Flushing—W. A. Walsh & Co., Bank of Manhattan Bldg., Bridge Plaza, Long Island City, sketches 100 x 120 ft. service garage, auto laundry, Dahlia Ave. and Main St. $70,000.

N. Y., New York—Berk-Lafayette Realty Co., L. Berkowitz, pres., 320 Bway., plans by D. S. Lang, 1860 Bway., 2 story, 80x145 ft. service garage, gas station, 403 Lafayette St. $75,000.

N. Y., Richmond Hill—Guthy Holding Corp., 18 East 48th St., New York, sketches by Murchison & Gompert, 101 Park Ave., New York, 4 story, 89 x 103 ft. service garage, Myrtle Ave. and East 116th St. $125,000.

Que., Montreal — Corporation, c/o V. H. Dandurand, pres., 414 St. James St. W., soon takes bids 3 story, 150 x 900 ft., rein.-con. garage, 2,100 car capacity, Champ de Mars, incl. tunnel between Craig and St. Paul Sts. $1,500,000. Ross & Macdonald, 601 Belmont St., archts.

BIDS ASKED

Mass., Cambridge—Jenny Mfg. Co., 8 India St., Boston, taking bids 1 story, concrete, service and filling station, Concord Ave. and Alewife Brook Parkway. Private plans.

Mass., Waltham—See "Contracts Awarded."

N. Y., Brooklyn—See "Contracts Awarded."

CONTRACTS AWARDED

Conn., Hartford—New England Electric Co., 103 Allyn St., brick, steel service building (probably) to Bartlett-Brainard Co., 252 Asylum St. Est. $75,000. **Maturity in spring.** Noted Dec. 25.

Fla., Ocala—W. B. Johnson, 75 x 109 ft., service station, garage and automobile sales building, Washington and Main Sts., to J. Thomson, Ocala.

Mass., Waltham—Bell Bros., 110 High St., 1 story, concrete block garage, storehouse, concrete found., separate contracts. $40,000. Private plans. Noted Jan. 29.

N. Y., Brooklyn—Nanman Building Corp., B. Ziskir, pres., 10360 104th St., Richmond Hill, 100x161 ft. service garage, gas station, 86th St. and Avenue W, separate contracts. To exceed $40,000. W. A. Lacerenza, 26 Court St., archt. **Maturity about September.** Noted Jan. 22.

POWER PLANTS

PROPOSED WORK

Ont., Hamilton — Hydro-Electric System of Hamilton, 12 King St. E., extending light and power system, incl. new substation in southwest part city, $150,000; ties between new substation and Dundas St. substation, $35,000; new primary lines, $130,000; new brick garage, $80,000. E. I. Sifton, 12 King St. E., engr.

Kan., Kansas City—Bd. Pub. Utilities, C. A. Lowder, secy., soon lets general contract 1 and 2 story, basement, 94 x 130 ft., rein.-con., steel, site old Quainpaw Water Plant. Burns & McDonnell Eng. Co., 407 Interstate Bldg., Kansas City, Mo., engrs. Noted Jan. 15.

BIDS ASKED

N. Y., Schenectady—See "Contracts Awarded."

CONTRACTS AWARDED

N. Y., Schenectady—General Electric Co., B. L. DeLack, mgr., River Rd., 26,700 hp. steam power plant, large mercury vapor turbine, 3/5 mi. rein.-con. tunnel, day labor. $4,000,000. New York Power & Light Co., subsidiary Niagara Hudson Power Co., 15 Broad St., New York, lessee. Noted Jan. 15.

SHOPS AND FOUNDRIES

PROPOSED WORK

Conn., Meriden—INDUSTRIAL SHOP—State Industrial School for Boys, R. L. McLaughlin, supt., sketches by W. T. Arnold, High St., Hartford, service building $50,000, work shop $200,000, garage $20,000. Noted Oct. 9.

Me., Oakland — FOUNDRY, etc. — Getchell Fdry. & Machine Wks., C. W. Getchell, rebuilding 1 and 2 story, concrete, timber foundry and wood turning mill, recently destroyed by fire. To exceed $40,000. Private plans.

Mass., Barnstable—SHOP — Wilfred Jordan, Oak Neck Rd., Hyannis, woodworking shop, Oak Neck Rd., Hyannis Sect. $40,000, incl. machinery.

N. J., Maplewood—SHOP and GARAGE—LeRoy Schenck, 513 Valley St., will not build 2 story, basement, brick, steel, 513 Valley St. $40,000. R. B. Flatt, 600 Bloomfield Ave., Bloomfield, archt. Noted Jan. 15.

N. J., Roselle—MACHINE SHOP—Hubeny Bros., 615 East 1st Ave., revised sketches 1 story, basement, brick, steel addition, $40,000.

N. Y., Brooklyn—REPAIR SHOP, etc.—Bayridge Fireproof Storage Corp., 322 9th St., sketches by H. G. Harrington, 311 100th St., 105x160 ft. repair shop, gas station, garage, 5th Ave. and 63rd St. $125,000.

O., Elyria—FOUNDRY—Elyria Fdry. Co., W. F. Gollmar, plans by E. G. Hoefler, archt. and engr., 5005 Euclid Ave., Cleveland, 1 story, 113 x365 ft., brick, steel, Filbert St. $100,000.

Ont., North Bay—IRON FOUNDRIES, etc.—Wm. Kennedy & Sons Ltd., Owen Sound, probably 1 and 2 story, steel and iron foundries and machine shop, brick, concrete. $50,000. Private plans.

CONTRACTS AWARDED

Calif., Elk Grove—MACHINE SHOP—Batey Bros., 1 story, 50 x 70 ft., brick, to J. Lillico, Elk Grove.

Calif., Richmond—SHOPS—Santa Fe R.R. Co., Kerckhoff Bldg., Los Angeles, 1 story, steel, brick, to Villadsen Bros., 417 Market St., San Francisco, $50,000. Noted Jan. 22.

Wis., Kewaunee — MACHINE SHOP, etc. — Frank Hamachek Machine Co., general contract 60 x 140 ft. machine shop, and 60 x 80 ft. foundry, to Austin Co., 16112 Euclid Ave., Cleveland, O. Est. $75,000.

WAREHOUSES

PROPOSED WORK

Calif., Oakland—City of Oakland Port Comn., 424 Oakland Bank Bldg., 100 x 518 ft. steel, concrete warehouse, Outer Harbor Terminal. Engineering Dept. of Owners, engrs.

N. J., Newark — Berkowitz Bros., Inc., 359 Plane St., will not build 3 story, basement, brick, steel warehouse, 423-5 Plane St. $150,000. S. Cohen, 134 Branford Pl., Newark, archt. Project abandoned. Noted Jan. 15.

N. Y., New York—Kay Moving Serv., 2464 Amsterdam Ave., soon lets contract 8 story, 32x100 ft. storage warehouse, 2468 Amsterdam Ave. $150,000. G. S. Kingsley, 103 125th St., archt. Noted Jan. 1.

BIDS ASKED

Mass., Beverly—See "Contracts Awarded."

CONTRACTS AWARDED

Calif., Los Angeles — See "Factories and Mills."

Mass., Beverly—Gulf Refining Co., Park Sq. Bldg., Boston, 2 story, 80x280 ft., sheet metal warehouse, Water St., to McClintic-Marshall Co., 68 Devonshire St., Boston, est. exceeds $40,000; 100x440 ft. timber pile wharf, to Aberthaw Co., 201 Marginal St., Chelsea, est. exceeds $25,000; 3 steel storage tanks, concrete found., and retaining wall, separate contracts, $25,000 or more. Private plans. Noted Sept. 4 under "Contracts Awarded."

Mass., Watertown—New England Telephone & Telegraph Co., 50 Oliver St., Boston, 1 story, 6 story and wing, concrete, steel, 85x265 ft. and 105x180 ft. warehouse, 120x140 ft. garage, to G. B. Macomber Co., 38 Chauncy St., Boston, est. exceeds $40,000; electrical work, to J. Livingston & Co., 80 Broad St., Boston, est. $25,000 or more; plumbing, to Pierce & Cox, 143 Kingston St., Boston, est. $25,000. Noted Jan. 8.

Vt., Burlington—Vermont Fruit Co., c/o B. J. Fayette, 210 Battery St., rebuilding 2 story, concrete warehouse, Battery St. Owner builds. Private plans.

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Commercial Buildings

BANKS

PROPOSED WORK

Conn., Mystic—Mystic River Natl. Bank, E. S. Huntley, sketches by Harper & West, 92 State St., Boston, Mass., bank. $150,000. Noted Dec. 25.

Ill., Peoria—Central Natl. Bank & Trust Co., South Adams St., F. F. Blossom, pres., remodeling present 3 story bank and office, constructing 7 story, brick, stone top addition, Main and Adams Sts. $250,000.

N. Y., Hornell—First National Bank, F. A. Bronson, pres., 4 story, 40 x 100 ft. bank, office.

CONTRACTS AWARDED

Ia., Des Moines — Bd. Directors Iowa-Des Moines Natl. Bank & Trust Co., 6th and Walnut Sts., 5 story (ultimately 21 story), basement, 125 x 135 ft., concrete, brick, stone, to A. H. Neumann & Co., 510 Hubbell Bldg. Est. $1,500,000. Noted Dec. 25.

CHURCHES

PROPOSED WORK

Calif., San Diego—Carmelite Sisters, c/o F. L. Hope, archt., 1033 Bank of Italy Bldg., 2 story, 160x200 ft., rein.-con. church, Hawley Ave. $200,000. Noted Aug. 7.

Conn., Middletown — St. Sebastian Roman Catholic Parish, A. Santolini, pastor, plans by R. C. Gorriani, 175 Green St., Worcester, Mass., and takes bids during March, 1 story, basement, 65 x 125 ft., granite, Washington St. $150,000. Noted Dec. 4.

Conn., Waterbury—Grace Baptist Church, I. W. Reed, pastor, 55 Highland Ave., church, Kingsbury and Brown Sts. $150,000 or more. Architect not selected.

Kan., Wichita—First Presbyterian Congregation, c/o G. E. Newell, pastor, and F. Carson, chn. building com., plans by G. H. Thomas, 405 Wheeler-Kelley-Hagney Bldg., chapel and educational building. $200,000. Noted May 1.

Mass., Brighton—HOME—Florence Crittenton League of Compassion, Inc., L. Higgins, 88 Tremont St., Boston, plans by Mowll & Rand, 21 School St., Boston, altering and constructing 2 story, basement, brick, stone addition, plain found., Pertshire Rd. $150,000.

Mass., New Bedford — St. Joseph's Roman Catholic Parish, J. A. Chagnon, Acushnet Ave., plans by F. A. Rousseau, 271 Union St., 1 story, basement, brick, stone, plain found., Acushnet Ave. and Tobey St. $300,000.

Mass., Springfield—First Christian Church Society, F. E. Reynolds, pastor, 127 Dickinson St., church. To exceed $150,000. Architect not selected.

Mass., Wakefield—First Baptist Church, A. H. Gage, pastor, 110 Lafayette St., sketches by E. M. Bridge, 248 Boylston St., Boston, 2 story, basement, brick, stone parish house, plain found., Common St. $150,000.

Minn., St. Paul—Christ Episcopal Church, W. H. Lightner, trustee, 312 Endicott Bldg., plans by C. H. Johnston, 360 Robert St., rein.-con., brick church, rectory, Pleasant Ave. and 6th St. $250,000.

N. J., Darlington—Immaculate Conception Seminary, c/o Myers & Stanley, archts., 24 Walnut St., Newark, will not build 2 story, basement, brick, steel seminary. $150,000. Project abandoned. Noted Jan. 15.

N. J., Fanwood—Fanwood Presbyterian Church, J. L. Ewing, pastor, 132 Bryant St., Rahway, will not build 2 story, basement, brick, steel church. $150,000. Project abandoned. Noted Apr. 24.

N. J., Garfield—First Presbyterian Church, R. W. Key, pastor, 132 Palisade Ave., sketches by J. H. Dynes, 7 Palisade Ave., brick, steel beam Sunday school. $150,000. Noted July 17.

N. J., Glen Ridge—Glen Ridge Congregational Church, Ridgewood Ave., revised plans by Guilbert & Betelle, 24 Branford Pl., Newark, 2 story, basement, brick, steel church, Sunday school. $200,000. Noted Jan. 1.

N. J., Guttenberg—Little Church on the Hill, D. R. Reese, pastor, 326 24th St., revised sketches 2 story, basement, brick, steel church, Sunday school, plain found., Bergenline Ave. $150,000.

N. J., Jersey City—St. Ann's Polish Church, F. J. Wzeciano, 291 St. Pauls Ave., will not build 2 story, basement, brick, steel church, rectory, garage, plain found., St. Paul's and Tonnelle Aves. $150,000. Noted Oct. 23.

N. J., Lyndhurst—Reed Memorial United Presbyterian Church, J. H. Littell, 346 Stuyvesant Ave., will not build 2 story, basement religious education building. $150,000. Project abandoned. Noted Nov. 27.

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N. Y., New York — United Presbyterian Church, c/o Building Com., 432 West 44th St., church, settlement house, gymnasium, swimming pool, 432 West 44th St. $400,000.

R. I., Pawtucket—Darlington Congregational Church Society, E. Murdock, pastor, 176 Robinson St., 3 story, basement, brick, stone parish house, Norfolk and Downes Aves. $150,000. Architect not selected.

N. J., Perth Amboy—St. Michaels Church, c/o G. W. Brooks, archt., 216 Smith St., 2 story, basement, brick, steel, Hull Ave. $150,000. Project in abeyance. Noted Jan. 8.

N. J., Red Bank—Lutheran Church, P. J. Pritscher, pastor, will not build 1 story, basement, brick, steel, River Rd., Spring St. and Throckmorton Ave. $150,000. Architect not selected. Project abandoned. Noted Dec. 25.

N. J., South River — Concklin Methodist Church, 1 and 2 story, tower, brick, steel church, Main and Gordon Sts. $150,000. Bids in. **Maturity indefinite.** A. Merchant, 1 Elm Row, New Brunswick, archt. Noted Jan. 15.

N. J., West New York — First Church of Christ Scientist, J. E. Orth, pres. Bd. Trustees, 208 49th St., Union City, revised sketches 1 story, basement, brick, steel, plain found., Blvd. and 10th St. $150,000. Noted Dec. 8.

Pa., Erie—Our Lady of Charity, J. M. Cannon, Bishop, 205 West 9th St., revised plans by W. T. Monahan, 805 Palace Hardware Bldg., and bids in spring, 3 story, 160 x 248 ft., brick, hollow tile, limestone monastery, chapel and dormitory, East Lake Rd. $250,000. Noted Aug. 28.

Pa., Pittsburgh — Jefferson Memorial Park Corp., 2882 West Liberty Ave., Dormont, H. C. Neel, pres., plans by Ingham & Boyd, Empire Bldg., 2 story, stone chapel and chimes, Baldwin Twp., near here. $150,000. T. W. Nicolet, Empire Bldg., landscape archt.

Pa., Pittsburgh—St. Henrys Roman Catholic Congregation, J. Meyer, rector, 2420 Arlington Ave., sketches by R. Marlier, Empire Bldg., brick, steel, church, 1,000 seating capacity, Arlington Ave. $200,000.

R. I., Woonsocket — Joan of Arc Roman Catholic Church, S. F. Dumont, pastor, c/o St. Anne's Rectory, 82 Cumberland St., plans by W. J. Fontaine, 285 Main St., 1 and 2 story, basement, brick church; parochial grade school, Mendon Rd. $150,000 or more funds being raised for same.

Que., St. Valier — H. Roger, pastor Roman Catholic Church, new church. $250,000.

BIDS ASKED

Md., Baltimore—Feb. 10, by Mottu & White, archts., Baltimore Life Bldg., brick, hollow tile, concrete, steel church, Edmondson Ave. and Church Lane, for St. Bartholomews P. E. Church, c/o architects.

N. J., Dunellen—Poggi & Bragdon, archts., 275 Morris Ave., Elizabeth, bids about Apr. 15, general contract 2 story, basement, brick, steel parish house, plain found., for First Methodist Church. $150,000. Noted Jan. 22.

N. J., Irvington (br. Newark)—N. Hulme, archt., 1524 Chestnut St., Phila., Pa., bids about May 1, on revised plans 2 story, basement, brick, steel, church, for Methodist Church, R. L. Luerich, pastor 64 Myrtle Ave. $250,000. Noted Sept. 18.

N. J., Lakehurst—P. Cret, archt., 112 South 16th St., Phila., Pa., bids about Apr. 15, general contract 1 story, tower, brick, steel memorial chapel, plain found., U. S. Naval Air Station, for American Legion Dpt. of New Jersey, 224 Highland Ave., Trenton. $150,000. Noted Feb. 13.

N. J., Wildwood — Stackhouse & Donohue, archts., 313 South Smedley St., Phila., Pa., taking bids general contract 2 story, basement, 50 x 110 ft., brick, steel, for Trinity Lutheran Church. $150,000. Noted Nov. 27.

N. Y., Long Island City — Church of St. Francis Assisi, church, 21st Ave. and 45th St., to Wilcox Constr. Co., 1 Bridge Plaza. Est. $150,000.

Que., Sherbrooke—Roman Catholic Parish of Notre Dame, J. A. Bussiere, pastor, general contract rein.-con., granite church, between Larocque and Alexandra Sts., to F. X. Lambert, Ste. Anne de la Pocatiere. Est. $274,000. Noted Sept. 11.

CLUBS

PROPOSED WORK

Calif., Sacramento—Y. W. C. A., E. Freeland, secy., sketches fireproof club, 17th and L Sts. Architect not selected.

Conn., Manchester—Town, W. A. Strickland, chn. Building Com., 81 Oakland Ave., revised plans by Hutchins & French, 11 Beacon St., Boston, Mass., community club building and library building, Y.M.C.A. units. $150,000 or more. Noted Oct. 9.

N. J., Clifton—B. P. O. E., F. A. Latimer, exalted ruler, 725 Clifton Ave., 2 story, basement club house addition. $150,000. **Maturity probably in March.** Architect not selected.

N. J., Glen Ridge—Glen Ridge Country Club, Ridgewood Ave., Montclair, will not alter and build 2 story, basement, brick, steel, golf club addition, Ridgewood Ave. $150,000. Project abandoned. Noted Jan. 15.

N. J., Jersey City—Knights of Columbus, 4[illegible] Jersey Ave., revised sketches by Kelly & Cow[illegible] 921 Bergen Ave., 2 story, basement, brick, st[illegible] club house. $150,000. Noted Oct. 16.

N. J., Jersey City—Polish American Soc[illegible] Club, S. Osiecki, pres., 196 Pavonia Ave., [illegible] story, basement, 45x165 ft., brick, steel cl[illegible] house, plain found. $150,000. **Maturity prob[illegible]bly in June.** P. Simeone & Co., 22 Journal S[illegible] archts. Noted Nov. 27.

N. J., Plainfield — Junior O. U. A. M., [illegible] Flagg, council, 2 story, basement, brick, st[illegible] club house, plain found. $150,000. **Maturity indefinite.** Architect not selected.

Pa., Pittsburgh—College Club of Pittsburgh, R. E. Davis, pres., 143 North Craig St., sketches by L. H. Button, Grant Bldg., club, probably stone, 5th and Bayard Sts. $150,000.

CONTRACTS AWARDED

Conn., Bridgeport—Algonquin Club, 211 State St., brick, steel, marble club house, to E. & F. Constr. Co., 94 Wells St., $128,891. Noted Dec. 25.

HOSPITALS

PROPOSED WORK

Ala., Mobile — Roman Catholic Diocese of Alabama and Northern Florida, c/o E. J. Hacket, pastor, sketches by Carey & Dowling Inc., 1st Natl. Bank Bldg. Annex, hospital $250,000. Noted Jan. 1.

Calif., Redwood City—San Francisco City and San Francisco Co. plans by H. H. Meyers, Kohl Bldg., San Francisco, 3 frame, stucco buildings at tubercular sanitarium, near here, San Mateo Co. $150,000.

Calif., San Francisco — University of California, Berkeley, sketches Class A out-patient building, Medical School campus. $500,000.

Conn., Greenwich—Town, sketches by W. B. Tubby, 475 5th Ave., New York, altering and constructing, 3 story, basement, brick, steel addition to Wethrill Pavilion, stone found. To exceed $150,000.

Conn., New Britain — New Britain General Hospital, Grand St., sketches by Stevens & Lee, 45 Newbury St., Boston, Mass., altering and constructing brick nurses home addition, Grand St. $150,000 or more.

Ind., Indianapolis — Bd. Health plans by Vonnegut-Bohn & Mueller, 610 Indiana Trust Bldg., 7 story, basement, 200 x 200 ft. rein.-con., brick ward building. $1,000,000. Noted Sept. 4.

Mass., Cambridge—Harvard University, A. L. Lowell, pres., altering and constructing infirmary and nurses home additions, Mt. Auburn St. $150,000 or more. Architect not selected.

Mass., Gloucester — Addison Brooks Gilbert Hospital, c/o Phillips & Holloran, archts., 119 Main St., soon lets contract 2 and 3 story, basement, brick, stone, steel nurses home and ward building, plain founds., Washington St. $150,000. Noted Jan. 29, under "Schools."

Mass., Springfield—Wesson Maternity Hospital, L. C. Tifft, pres., 120 High St., sketches by Stevens & Lee, 45 Newbury St., Boston, private patients building, hospital unit, High St. $150,000.

Mass., Westfield—Noble Hospital, M. Smylie, supt., 3 story, basement, hospital addition, West Silver St. $300,000. Architect not selected.

Minn., St. Paul—Charles T. Miller Hospital, 125 College Ave., soon takes bids nurses home, $250,000. C. H. Johnston, 360 Robert St., archt.

Mo., St. Louis — Bethesda Hospital, 3649 Vista Ave., sketches by Smith & Gauger, 317 North 11th St., rein.-con., brick, stone hospital. $1,500,000. Pond & Pond, Martin & Lloyd, 180 North Michigan Ave., Chicago, Ill., assoc. archts.

Nev., Las Vegas—R. W. Martin, 2 story, 64x190 ft. hospital. $150,000. Architect not selected.

N. H., Goffstown — Hillsboro County Hospital nurses home, out buildings. $160,000. Architect not selected.

N. J., Browns Mill—Deborah Relief Society, M. M. Unger, chn., 763 Broad St., Newark, Deborah Sanitarium and Power Plant, 4 story, basement, brick, steel. $600,000. Project in abeyance. F. Grad, 1023 Broad St., Newark, archt. Noted Nov. 13.

N. J., Somerville—Bd. Trustees Somerset Hospital, C. C. Kenyon, pres., brick, steel, addition. $150,000. **Maturity in 1932.** Architect not selected. Noted Jan. 15.

N. J., Toms River—Ocean Co. Hospital, Inc., J. Bierich, in charge, will not build 2 story, basement, brick, steel hospital, Main St. $150,000. Noted May 8.

Hospitals (Continued)

Tex., El Paso—City and El Paso Co., defeated $550,000, for hospital. Trost & Trost, El Paso, archts. Noted Jan. 8.

BIDS ASKED

Calif., Colusa — Feb. 17, by Bd. Supervs. Colusa Co. (1st unit) part 1 and 2 story, rein.-con. hospital, $66,000. Total $150,000. O. Deichmann, 110 Sutter St., San Francisco, archts. Noted Aug. 7.

Calif., Norwalk — Feb. 17, by State Dpt. P. Wks., Division Architecture, Sacramento, 2 story, 7,600 sq.ft. floor space, rein.-con. night attendants quarters: 2 story, rein.-con., 6,800 sq.ft. floor space day attendants quarters: 1 story, frame, stucco, 1,800 sq.ft. floor space residence, for State of California.

Calif., Spadra—Feb. 17, by State Dpt. P. Wks., Division Architecture, Sacramento, 2 story, 18,000 sq.ft. floor space hospital, 1 story, 4,300 sq.ft. floor space administration building, 1 story, 2,200 sq.ft. floor space industrial building addition, all rein.-con., for State of California.

Ia., Davenport—Feb. 21, by Schmidt, Garden & Ericksen, archts., 104 South Michigan Ave., 5 story, basement, 72 x 233 ft., rein.-con. brick hospital addition, for Sisters of Mercy. $300,000. Noted July 24.

N. J., Preakness—Bd. Freeholders, Passaic Co., Court House, Paterson, bids about Feb. 15, 3 story, basement, brick, steel welfare house, detention home, incl. laundry, power house, plain found., Oldham Rd. $500,000. F. W. Wentworth, 140 Market St., Paterson, archt. Noted Jan. 15.

Tenn., Nashville—Feb. 16, by Asmus & Clark, archts., 1415-18 Nashville Trust Bldg., improvements to general hospital, nurses home addition, main hospital addition, remodeling main hospital, Nance St. and Hermitage Ave., for Bd. Hospital Comrs., W. C. Dixon, secy. Noted Oct. 23.

CONTRACTS AWARDED

Calif., San Francisco—S. J. Hester, secy. Bd. P. Wks., City Hall, general contract steel, brick ward additions to general hospital, to Barrett & Hilp, 918 Harrison St., for City and San Francisco Co. $269,837. Noted Dec. 25.

Md., Crownsville (mail Waterbury) — At office J. E. Perry, archt., Calvert Bldg., Baltimore, 4 story, 35 x 85 ft., rein.-con., brick nurses home, to T. Mullan, 3945 Greenmount Ave., Baltimore, for Crownsville State Hospital. $150,000. Noted Jan. 15.

Mass., Belmont—McLean Hospital, Pleasant St., altering and constructing 3 story, basement, brick, steel Hyptherapy rooms addition, to Holt-Fairchild Co., 7 Water St., Boston. Est. $150,000.

Mass., Somerville—Stevens & Lee, archts., 45 Newbury St., Boston, 4 story, basement, 40 x 160 ft., brick, concrete, steel hospital, plain found., to C. C. Temple Co., 99 Chauncy St., Boston, for Somerville Hospital Trustees, E. J. Dreyer, chn. Building Com., est. $160,000: heating and ventilating, to Rideout, Chandler & Joyce, 130 Broad St., Boston, est. $25,000: plumbing, to Cox & Johnson, 257 Broadway, Boston, electrical work, to M. B. Foster Electric Co., 514 Atlantic Ave., Boston, est. $25,000. Noted Dec. 4.

Mich., Wyandotte—D. J. V. Snyder, archt., 939 Penobscot Bldg., Detroit, 4 story, brick, steel, rein.-con. hospital addition and 5th floor top addition to present hospital, plain found., to H. G. Christman Burke Co., Fisher Bldg., Detroit, for Wyandotte General Hospital. Est. $150,000. Noted Oct. 23.

Neb., Omaha — Bd. Supervs. Douglas Co., 5 story, basement hospital, to R. V. Gould Co., City Natl. Bank Bldg., $498,914. Noted Dec. 25.

LOFTS

PROPOSED WORK

N. J., Newark — Owner, c/o J. Centanni, archt., 142 Market St., sketches brick, steel loft addition. $150,000.

OFFICES

PROPOSED WORK

Calif., Long Beach—Long Beach Building & Loan Assn., 1st St., plans by W. H. Austin, Pacific Southwest Bldg., part 2 and 3 story rein.-con. office, 1st and Locust Sts. $150,000.

Calif., Los Angeles — T. D. Barnett, c/o Morgan, Wells & Clements, Van Nuys Bldg., 12 story, basement, rein.-con., steel office, store, Hollywood Blvd. $500,000.

Calif., Los Angeles—Thomas D. Barnett, 6372 Hollywood Blvd., plans by Morgan, Walls & Clements, 1135 Van Nuys Bldg., 12 story, basement, rein.-con., terra cotta, tile, steel office and store building, Hollywood Blvd. between Wilcox and Cahuenga Aves. $750,000.

Calif., Sacramento—H. Mitau, et al., 1422 40th St., plans by G. Sellon & Co., California State Life Bldg., 16 story, basement, rein.-con., 8th and J Sts. $750,000.

Del., Wilmington — Delaware School Foundation, A. J. Taylor, vice pres., Du Pont Bldg., sketches by Guilbert & Betelle, 20 Branford Pl., Newark, N. J., 3 story, basement, brick, steel office, plain found. $150,000.

Ind., Indianapolis—Grain Dealers' Mutual Insurance Agency, Inc., Guaranty Bldg., plans by Rubush & Hunter, 1020 Architects Bldg., rein.-con., brick, stone office, 1740 North Meridian St. $150,000.

N. J., Newark — Eagle Fire Insurance Co., F. W. Fort, genl. mgr., 18 Washington Pl., revised sketches by F. A. Phelps, 21 Fulton St., 3 story, basement, brick, steel office, Halsey St. and Washington Pl. $150,000. Noted Jan. 29.

Mass., Quincy — Standard Oil Co. of New York, Park Sq. Bldg., Boston, revised plans office, garage, docks and tanks between Town River and Washington Sts. $1,000,000. H. R. Morse, c/o owner, engr.

N. J., Paterson—Medical Tower Building Corp., c/o Goodman & Shulman, archts., 20 Smith St., 10 story, basement, 50x75 ft., brick, steel, rein.-con. medical tower office, Bway. and Auburn St. $600,000. **Maturity indefinite.** Noted Dec. 18.

N. J., Jersey City—Stone House Realty Co., A. W. Feinberg, 75 Montgomery St., 10 story, basement, brick, steel office, store, Newark and Summit Aves. $150,000 or more. **Maturity in 1932.** Architect not selected. Noted Jan. 8.

N. J., Montclair — Corporation, c/o W. Sambur, archt., 160-02 Jamaica Ave., Jamaica, N. Y., 6 story, basement, 100 x 125 ft., brick, steel, Bloomfield Ave. $150,000 or more. Project in abeyance. Noted Jan. 15.

N. J., Newark—Eagle Fire Insurance Co., F. W. Fort, genl. mgr., 18 Washington Pl., 3 story, basement, brick, steel, Washington Pl. and Halsey St. $150,000. **Maturity about April.** Noted Dec. 4.

O., Cincinnati — Myers Y. Cooper Co., 408 Union Trust Bldg., plans by W. Franklin, 408 Union Trust Bldg., 5 story, basement, 75 x 116 ft., brick, rein.-con. office and apartment building, plain found., Erie Ave. $150,000.

Tex., Galveston—Gulf, Colorado & Santa Fe Ry., c/o F. G. Pettibone, vice pres., Galveston, 8 story, with 11 story tower, brick, terra cotta, steel, rein.-con., pile found., also 29x52 ft., brick, rein.-con. boiler house, 25th and Strand Sts. Private plans.

BIDS ASKED

N. J., Irvington (mail Newark) — **W. E. Lehman**, archt., 972 Broad St., Newark, taking bids general contract 2 story, basement, 80 x 160 ft., brick, steel office, store, 1015-19 Springfield Ave., for United States Realty & Investment Co., 972 Broad St., Newark. $150,000. F. and W. Grand, Inc., 151 Newark Ave., Jersey City, lessee. Noted Jan. 12.

CONTRACTS AWARDED

N. J., Elizabeth—F. K. Sauer, 109 Broad St., general contract 2 story, basement, brick, steel, office, stores, 1147 East Jersey St., to I. Enzer, 21 Orchard St. Est. $150,000. Noted Dec. 11.

N. J., Ridgewood—A. Davis, c/o C. S. Keyser, archt., 241 Prospect St., general contract 4 story, basement, brick, steel office, stores, Ridgewood Ave. and Chestnut St., to Adams-Faber Co., 247 Lorraine Ave., Montclair. Est. $150,000.

Okla., Duncan—Syndicate forming, 5 story, basement, first floor 75 x 140 ft., upper floors 60 x 75 ft., concrete, brick, to J. J. Hart, 1428 West 27th St., Oklahoma City.

PUBLIC

PROPOSED WORK

Calif., Los Angeles—COMMUNITY HOUSE and AUDITORIUM—City plans by City Playground Dpt., City Hall, Class A rein.-con., Venice Section. $150,000 bonds will be voted to finance construction.

Calif., Martinez—HALL of RECORDS—Contr. Costa Co. plans by W. H. Weeks, 525 Market St., San Francisco, Class A Hall of Records Building. $500,000. Noted Dec. 25.

Conn., Bridgeport — COURT HOUSE — Fairfield County Court Comn., Court House, Golden Hill, plans by Fletcher-Thompson, Inc., 1336 Fairfield Ave., altering and constructing 3 story, basement, brick, brown stone addition to court house, Golden Hill. $150,000.

Mass., Boston—POLICE STATION—City, Dpt. P. Bldgs., police station, South end sect. to house police of present La Grange and Dedham Sts. police stations. $350,000. Architect not selected.

Mass., Boston — WELFARE — City, Dpt. P. Bldgs., sketches by Hutchins & French, 11 Beacon St., brick public welfare building, rear of present building, Bowker St. To exceed $150,000.

Mass., Hingham—POLICE STATION—Town, F. M. Smith, chn. building com., sketches by L. Foster, 6 Middle St., 2 story, basement central police station. $150,000. Noted Jan. 16, 1930.

Mass., Mattapan (sta. Boston)—ASSEMBLY HALL—Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, revised sketches by Kendall, Taylor & Co., 209 Columbus Ave., Boston, 2 story, basement, brick, Boston State Hospital Unit. $150,000. Noted Mar. 27.

Mass., Quincy—FIRE STATION—City, T. J. McGrath, mayor, 2 story fire station, Quincy Point Sect. $150,000. Architect not selected.

Mass., Wareham—TOWN HALL—Town Bd. Selectmen, W. B. Holbrook, 2 story, basement, brick town hall. $150,000. Architect not selected.

Mass., Worchester—COURT HOUSE—Worcester Co. Comn., W. Goodale, chn., Court House, altering and constructing court house addition, Lincoln St. $150,000. Architect not selected.

Nev., Las Vegas—COURT HOUSE—Clark Co., W. L. Scott, clk., 2 story annex, incl. county offices and jail. $150,000. Architect not selected.

Nev., Reno — COURT HOUSE — Washoe Co. plans by F. J. DeLongchamps, Gazette Bldg., 2 story, fireproof addition. $150,000 bond election soon for same.

N. J., Caldwell — BORO HALL — Bd. Boro Council, Boro Hall, revised sketches by Guilbert & Betelle, 20 Branford Pl., Newark, 2 story, basement, brick, steel. $200,000. Noted Nov. 7 Daily.

N. Y., Jamaica—LIBRARY—Queensboro Pub. Library, Administration Bldg., 150-24 Jamaica Ave., Jamaica, will not build library addition, 8914 Parsons Blvd. $1,000,000. Project abandoned. Noted Apr. 17.

N. J., Newark—FIRE HOUSE—Bd. City Comrs., City Hall, 2 story, basement, brick, steel, 18th Ave. and Norwood St. $150,000. Project in abeyance. F. Grade, 1023 Broad St., archt. Noted Jan. 15.

N. J., Red Bank—LIBRARY—Bd. Boro Council, Boro Hall, sketches 2 story, basement, brick, steel. $150,000. Noted Nov. 6.

N. C., Raleigh—AUDITORIUM—City plans by H. P. S. Keller & A. J. Maxwell, Jr., Raleigh, 2 story, brick, stone building with convention hall, 5,000 seating capacity, smaller assembly rooms, committee rooms, armory room, American Legion rooms, Fayetteville St. $425,000. Noted Nov. 6.

W. Va., Clarksburg—COURT HOUSE—Bd. Comrs. Harrison Co. plans by Walker & Weeks, 2341 Carnegie Ave., Cleveland, O., court house, $600,000.

Wyo., Laramie—COURT HOUSE—Bd. Comrs. Albany Co., sketches by W. Dobois, Hynds Bldg., Denver, Colo., 3 story court house. $225,000. Noted Jan. 8.

Ont., Hamilton—JAIL—City, 2 or 3 story, basement, brick, stone, concrete, steel. $250,000. Architect not selected. Noted Nov. 13.

Ont., Sandwich—COURT HOUSE—Essex Co., Court House, plans by D. J. Cameron, Bartlett Bldg., Windsor, 2 or 3 story, basement, brick, stone, concrete, steel addition. $200,000. Noted Nov. 13.

BIDS ASKED

Mass., Newton—COURT HOUSE—Feb. 10, by Middlesex Co. Comn., Court House, Cambridge, 2 story, basement, brick, concrete, steel district court house, plain found., Washington and Elm Sts. $150,000 or more. J. H. Ritchie & Associates, 250 Stuart St., Boston, archts. Noted Nov. 20.

Mass., Newton—POLICE STATION—Feb. 10, by City, Public Building Comn., 2 story, basement, brick, stone, steel, concrete, plain found., Washington St., $150,000: Feb. 23, heating, plumbing, and electrical work for same, $25,000. J. H. Ritchie & Associates, 250 Stuart St., Boston, archts. Noted Jan. 1.

N. J., Menlo Park—HOME—Feb. 17, by State Bd. Institutions & Agencies, W. J. Ellis, comr., State Office Bldg., Trenton, New Jersey War Veterans Home, 3 story, basement, brick, steel, $500,000. Div. Architecture & Constr., State Office Bldg., Trenton, archts. J. E. Brinley, 156 5th Ave., New York, assoc. archt.

N. J., Morristown — COURT HOUSE — Bd. Freeholders Morris Co., Court House, bids about Apr. 1, general contract 4 story, basement, brick, steel, rein.-con. addition, plain found., Washington and Court Sts. $250,000. Palmer & Plonsky, 55 William St., New York, archts. Noted Nov. 27.

N. Y., Comstock—ADMINISTRATION—Feb. 17, by Commissioner Correction, State Office Bldg., Albany, administration building, Great Meadows Prison; adv. E. N.-R. Feb. 5. Noted Dec. 25.

CONTRACTS AWARDED

Calif., Sacramento—LEGION MEMORIAL and OPERA HOUSE—San Francisco Memorial Bd. Trustees, foundation work, 4 story, basement legion memorial building, 6 story, basement opera house, civic center, for City and San Francisco Co., to L. J. Cohn, 1 De Haro St., $236,200. Noted Jan. 15.

Calif., San Francisco—HOME—S. J. Hester, secy. Bd. P. Wks., City Hall, general contract Laguna Honda Home, to be known as Wards K and L, Class A steel, brick, to Anderson & Ringrose, 320 Market St., $324,400. Noted Dec. 18.

Conn, Simsbury—TOWN HALL—Town, Bd. Selectmen, Town Hall, for Enos Memorial Town Hall, brick, stone, to Industrial Constr. Co., 721

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Public (Continued)

Main St., Hartford. Est. $350,000. Noted Jan. 8.

Ill., Chicago—LIBRARY—Bd. Directors Chicago Pub. Library, H. G. Wilson, secy., masonry contract 2 story, 118 x 126 ft., brick, to J. H. McHugh, 840 West 70th St., $120,500. Noted Dec. 4.

N. J., Jersey City—STAFF HOUSE—Bd. City Comrs., City Hall, general contract 12 story, basement, 65 x 110 ft., brick, steel, to J. Mitchell, Inc., 24 Journal Sq. Est. $642,300. Noted Jan. 2 Daily.

B. C., New Westminster—MENTAL HOME—Provincial Govt., Victoria, reconstructing brick, timber mental home, to Archie Hogg Constr. Co. Ltd., New Westminster and Pacific Engineers Ltd., 1044 Beach Ave., Vancouver, $186,000.

RESIDENTIAL

BIDS ASKED

Calif., Los Angeles—F. Sward, archt., 508 Delta Bldg., taking bids 7 story, basement, 60 x 125 ft., Class A rein.-con., Detroit St. near Wilshire Blvd., for E. and E. McIntyre, c/o architect. $175,000.

La., Baton Rouge — Feb. 10, by Interstate Hotel Co., Baton Rouge and Shreveport, 17 story, rein.-con., steel, brick, stone hotel, pile found. $200,000. E. F. Neild, Shreveport, archt.

Mass., Lexington—Owner, c/o Kilham, Hopkins & Greeley, archts., 9 Park St., Boston, taking preliminary bids, 4 story, basement, brick, plain found. $160,000.

Mass., Malden (br. Boston)—S. Gould, 115 Bryant St., taking bids 4 story, basement, brick, stone, steel, concrete found., Ferry St. $165,000. A. H. Dow, 192 Boylston St., Boston, archt.

Mass., Newton—H. O. Townsend, 1359 Hancock St., Quincy, soon takes bids Center and Mt. Ida Sts. $150,000 or more. E. B. Stratton, 113 State St., Boston, archt.

Minn., Minneapolis—Feb. 12, by E. J. Loring, chn. building com., 642 McKnight Bldg., 12 story, basement, rein.-con., brick, limestone clubhotel, swimming pool, 12th St. and La Salle Ave., for Minneapolis Columbus Club, Inc., Elks Bldg. $1,000,000. Bertrand & Chamberlin, 616 Civic and Commerce Bldg., archts.

N. M., Clovis—Southern Natl. Hotel Co., c/o F. Canady, Galveston, Tex., soon lets contract 9 story, basement, 48 x 110 ft., brick, rein.-con., hotel, stores, 48,000 sq.ft. floor space, $400,000. A. Fraser, 624 American Life Insurance Bldg., Galveston, archt. Noted Dec. 11.

N. J., Elizabeth—See "Contracts Awarded."

N. Y., Brooklyn—See "Contracts Awarded."

N. Y., Bronxville—J. M. Felson (owner and archt.), 250 West 57th St., taking bids on separate contracts apartment, garage, Park View Pl. $1,500,000. Noted Oct. 6.

R. I., Providence—Owner, c/o H. Marshak, archt., 36 Exchange Pl., taking bids 3 story, basement, brick, plain found., Elmwood Ave. $150,000.

CONTRACTS AWARDED

Ark., Hot Springs—Syndicate Forming, c/o G. R. Bartling, Inc., 567 Paul Brown Bldg., St. Louis, Mo., 8 story, basement, 60 x 108 ft. T shaped, with 7 story, rein.-con., brick, Algonite stone hotel, and 150 car garage, to Hercules Contg. Co., Wainwright Bldg., St. Louis, Mo.

Calif., Los Angeles—S. Gawecki, c/o A. R. Sedgley, archt., 816 Architects Bldg., 7 story, basement, sub-basement, 45 x 118 ft., rein.-con., Bway. and Gramercy Blvd., to Mishelle Constr. Co., 816 Architects Bldg., $175,000.

Calif., Los Angeles—W. R. Sant, 6 story, basement, Class A, 1st St. and Gramercy Blvd., to General Eng. Serv., 112 North Main St. $175,000.

Calif., Redlands—Redlands Income Properties Ltd., c/o E. Voellmy, archt., 81 North Buena Vista St., 3 story, basement, 118x160 ft., rein.-con., brick, 9th and State Sts., to R. W. Brown, 136 West Merrill Ave., Riverside. $200,000.

Mo., St. Louis—Ambassador Investment Co., 3 story, basement, 81 x 160 ft., brick, terra cotta, concrete found., 4915 West Pine Blvd., to J. Rubin & Son, Wainwright Bldg.

N. J., Atlantic City—Atlantic Towers Corp., 26 Court St., Brooklyn, 16 story, basement, brick, steel, rein.-con. hotel, Boardwalk, to William Kennedy Constr. Co., 215 Montague St., Brooklyn, N. Y. Est. $6,000,000. **Maturity indefinite.**

N. J., Elizabeth—Westcourt Apartments, Inc., M. Falkenflick, pres., Westfield Ave., 3 story, basement, brick, steel, Westfield Ave., separate contracts. $150,000. J. B. Beatty, 157 North Read St., archt.

N. Y., Brooklyn—Madison Gardens, Inc., B. Govern, pres., c/o Daidone & Grant, 189 Montague St., 6 story, 224 x 256 ft. apartments, Kings Highway, East 24th St. and Bedford Ave., separate contracts. $400,000.

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SCHOOLS

PROPOSED WORK

Calif., Los Angeles—City of Los Angeles School Dist. plans by A. S. Nibecker, Jr., city school archt., 2 story, basement, concrete brick, 32nd St. $150,000.

Calif., Los Angeles—Marymount College of the West, 28th St., plans by R. Montgomery, 572 Chamber of Commerce Bldg., 2 story, 45 x 450 ft., brick, stucco, stone, steel, 814 West 28th St. $350,000.

Calif., Los Angeles—Los Angeles School Dist., revised plans by Architectural Dpt. Bd. Educ., University High School Auditorium, brick, concrete. $175,000. Former bids rejected. Noted Dec. 1.

Calif., Saticoy—Saticoy School Dist., plans by R. C. Wilson, 112 South Mill St., Santa Paula, fireproof school. Election $150,000 bonds, for same.

Conn., Hartford — Oxford School, R. E. Guernsey, 695 Prospect St., school, Bloomfield Ave. and Cottage St. To exceed $150,000. Architect not selected.

Conn., Meriden—State, Industrial Boys School, R. L. McLaughlin, supt., sketches by W. T. Arnold, High St., Hartford, gymnasium $275,000, dormitory $200,000, hospital unit $130,000, cottages $140,000, all brick. Noted Nov. 20.

Conn., New Britain — St. Joseph's Roman Catholic Church, J. F. Donohue, pastor, 195 South Main St., 2 story, basement, brick, school, plain found., Edson St. $150,000 or more. Private plans.

Conn., Terryville — Town, Superintendent Schools, new high school. $150,000. Architect not selected.

Del., Milford—Delaware School Foundation, A. J. Taylor, vice-pres., Du Pont Bldg., Wilmington, sketches by Guilbert & Betelle, 20 Branford Pl., Newark, N. J., 2 story, basement, brick, steel, grade and high school addition, plain found. $150,000.

Ind., Connersville — School Comrs. Orange Twp. plans by Henkel & Hanson, Connersville, brick, steel school. $150,000.

Ind., Laporte—School Comrs. plans by G. W. Allen, 209 Savings Bank Bldg., 2 story, basement, 78x217 ft., rein.-con., brick high school, Harrison St. $150,000.

Ind., Wheatfield—School Comrs. plans by J. Bruck, Kentland, 2 story, basement, brick, rein.-con. school. $150,000.

Ind., Nappanee—School Comrs. revised plans by Henkel & Hanson, Connersville, 2 story, basement, brick, steel, stone school, incl. gymnasium, chemical laboratory. $150,000.

Ia., Des Moines—Drake University Dormitory Assn., c/o H. J. Clark, member of Bd. Directors, sketches brick, concrete dormitory 28th St. and University Ave. $200,000. Architect not selected.

Me., Charleston—Higgins Classical Institute, E. E. Herrick, pres. Bd. Trustees, Bangor, sketches by Crowell & Lancaster, 6 State St., Bangor, school buildings. To exceed $150,000.

Me., Kents Hill — Kents Hill Seminary, Bd. Trustees, F. E. Eastman, pres., Portland, new dormitory, remodeling old dormitories, seminary grounds. To exceed $150,000. Architect not selected.

Mass., Boston—City, Dpt. School Buildings, high school, West Roxbury. To exceed $150,000. Architect not selected.

Mass., Boston—Harvard University, A. L. Lowell, pres., plans by Coolidge, Shepley, Bulfinch & Abbott, Ames Bldg., 3 story, basement, brick, stone, Mt. Auburn and Plymton Sts. $400,000.

Mass., Boston—City, Dpt. School Buildings, public latin school for boys. To exceed $150,000. Architect not selected.

Mass., Cambridge—Harvard University, A. L. Lowell, pres., sketches by Coolidge, Shepley, Bulfinch & Abbott, Ames Bldg., Boston, 3 story, basement, brick astronomy building, between Concord Ave. and Garden St. $150,000.

Mass., Lawrence—City, M. A. Sanders, mayor, City Hall, brick, elementary school, East Haverhill, Sargent and Clark Sts. $150,000 or more. Architect not selected.

Mass., Lexington — Town, Bd. Selectmen, sketches by Kilham, Hopkins & Greeley, 9 Park St., Boston, 2 story, basement, brick, stone grammar school, plain found., East Lexington Sect. $150,000-$175,000. Noted Oct. 16.

Mass., Mansfield—Town, H. E. Everett, town mgr., Junior and Senior High School, South Main St. $300,000. Architect not selected.

Mass., Marlboro — City, School Building Comn., sketches by M. A. Dyer Co., 1 Beacon St., Boston, 2 story, basement, brick, stone, plain found., Hildreth St. $200,000.

Mass., Medford (br. Boston) — City, A. J. Harty, chn. com., 2 story, basement, brick school, Forest Park Sect. $150,000. Architect not selected.

Mass., Melrose — City, R. A. Perkins, chn. comn., sketches by J. W. Beal Sons Co., 18 Devonshire St., Boston, 2 story, basement, brick, stone, steel high school addition, plain found., Main St. $750,000. Noted May 5.

Mass., Northampton—City, Building Comn., City Hall, high school. To exceed $150,000. Architect not selected.

Mass., Pittsfield—City, J. F. Cannon, supt. schools, 2 story, brick, school, Lower Elm St. $150,000. Architect not selected.

Mass., Raynham — Town, School Comn., S. White, sketches by F. I. Cooper Corp., 42 Winter St., Boston, altering and reconstructing Centre School or constructing entire new building. $150,000 or more.

Mass., Roslindale (sta. Boston) — City of Boston, Dpt. School Buildings, plans by W. W. Drummey, 80 Boylston St., Boston, 2 story, basement, brick, stone, steel school, plain found., Charles Sumner Dist. To exceed $200,000.

Mass., Springfield—City, Mayor's office, City Hall, elementary school, Boston Rd. $150,000-$200,000. Architect not selected.

Mass., Springfield—City, Mayor's Office, City Hall, trade school. $150,000 or more. Architect not selected.

Mass., Swampscott — Town, H. S. Baldwin, chn. Bldg. Com., new sketches by Cram & Ferguson, 248 Boylston St., Boston, brick, limestone, steel high school, plain found., Phillips Park and Humphrey St. $350,000. Noted May 15.

Mass., Waltham—St. Mary's Roman Catholic Parish, J. J. Baxter, 133 School St., sketches by T. E. Sheehan, 120 Boylston St., Boston, altering and constructing 2 and 3 story, basement brick parochial high school addition, plain found., Lexington St. $150,000. Noted Jan. 29.

Mass., Wareham—Town, B. C. Merry, supt. schools, 2 story, basement, brick school. $150,000 or more. Architect not selected.

Mass., Weymouth—Town, P. T. Pearson, supt. schools, 2 story, basement, brick school, Weymouth Centre, $150,000; also school, Weymouth Heights Sect., $150,000. Architect not selected.

Minn., St. Paul—St. Luke's School, J. C. Byrne, 22 Lexington Ave. N., rein.-con., brick, 880 Portland Ave. $250,000.

Mo., Clayton—Bd. Educ., J. J. Bracken, 7500 Maryland Ave., bids in February, altering and constructing cafeteria addition to high school, 7500 Maryland Ave., $56,500; altering and constructing 2 story, basement, 45x65x70x109 ft. addition to Glen Ridge School, Glen Ridge and Wellington Dr., $110,000; altering and constructing 2 story, basement, 36x49x78x150 ft. addition to Bellevue School, Bellevue Ave., $78,000. W. B. Ittner, Inc., Continental Life Bldg., St. Louis, archts.

N. J., Bergenfield—Bd. Educ., C. S. Decker, dist. clk., 45 Smith Ave., 2 story, basement, brick, steel, near Prospect Ave. $185,000. A. Dore, 173 Main St., Hackensack, archt. Project in abeyance. Noted Dec. 18.

N. J., Bloomfield—Bd. Educ., City Hall, revised plans by Bartlett & Marsh, Lefcourt Bldg., Newark, 2 story, basement, brick, steel, rein.-con. Watchung and Broughton Aves. $350,000. Noted Jan. 15.

N. J., Bordentown—Dpt. Institutions & Agencies, State House, Trenton, dormitory, at Manual Training and Industrial School. $160,000. C. N. Leathem, Trenton state archt. Noted Dec. 11.

N. J., Dover — Bd. Educ., High School, 2 story, basement, brick, steel, State Hy. and McFarlan St. $150,000. Project in abeyance. Architect not selected. Noted Jan. 22.

N. J., Freehold—Bd. Educ., W. Thrackmorton, pres., will not build Junior High School, 2 story, basement, brick, steel. $150,000. Project abandoned. Noted July 3.

N. J., Haledon (mail Paterson)—Bd. Educ., J. W. Grimshaw, pres., 305 Haledon Ave., revised sketches by J. V. Van Vlandren, archt., 140 Market St., Paterson, 2 story, basement, brick, steel, Barbour St. $150,000. Noted Mar. 27.

N. J., Harrington Park—Bd. Educ., Harrington Park, 2 story, basement, brick, steel addition. $150,000. Project in abeyance. W. H. Wright, Harrington Park, archt. Noted Nov. 6.

N. J., Hasbrouck Heights—Bd. Educ., Administration Bldg., Junior and Senior High School, 2 story, basement, brick, steel. $150,000. Tooker & Marsh, 101 Park Ave., archts. Project in abeyance. Noted Dec. 18.

N. J., Hawthorne — Bd. Educ., Lafayette School, 2 story, basement, brick, steel, high school. $150,000. **Maturity about May.**

N. J., Hillside (br. Elizabeth)—Bd. Educ., Central Grammer School, 2 story, basement, brick, steel high school. $150,000. Architect **not selected. Maturity about May.** Noted Dec. 25.

N. J., Jamesburg—Bd. Educ., 14 room school. $145,000.

Schools (Continued)

N. J., Lakewood—Bd. Educ. revised sketches by C. B. Cook, Asbury Park Trust Bldg., Asbury Park, 2 story, basement, brick, steel, rein.-con., plain found. $200,000. Noted Jan. 22.

N. J., Lyndhurst (br. Rutherford)—Bd. Educ., High School, sketches by Guilbert & Betelle, 20 Branford Pl., Newark, 2 story, basement, brick, steel addition to Washington School, Ridge Rd. $200,000.

N. J., Margate—Bd. Educ., 2 story, brick, steel, rein.-con. school. $150,000. Project in abeyance. Architect not selected. Noted Dec. 25.

N. J., Montclair—State Bd. Educ., Trenton, 3 story, basement, brick, steel normal school auditorium, Montclair Normal School. $150,000. Architect not selected. **Maturity in spring.** Noted Nov. 13. Steam heating.

N. J., Orange—Carteret Academy, 317 Carteret Pl., sketches 2 story, brick, steel, Orange St. $200,000.

N. J., Piscataway—Bd. Educ. Raritan Twp. revised sketches by A. Merchant, 1 Elm Row, New Brunswick, Piscataway town School, 2 story, basement, brick, steel, rein.-con., plain found. $200,000. Noted Oct. 9 Daily.

N. J., Piscataway town — Bd. Educ., Raritan Twp., 2 story, basement, brick, steel, addition to Oak Tree School. $150,000. Jensen & Rasmussen, 218 Smith St., Perth Amboy, archts. Project in abeyance. Noted Jan. 8.

N. J., Pompton Lakes—Bd. Edu., J. Hutton, dist. clk., 96 Perrin Ave., Senior High School, 2 story, basement, brick, steel, rein.-con., plain found. $150,000. Project in abeyance. Noted June 27.

N. J., Sussex—Bd. Educ., High School, 2 story, basement, brick, steel high school. $150,000. Project in abeyance. Noted Jan. 15.

N. J., Teaneck (br. Hackensack)—Bd. Educ., High School, receiving competitive sketches 2 story, Garrison Ave. $200,000. Former plans abandoned. Architect not selected. Noted Apr. 10.

N. J., Union City—Bd. Educ., 415 32nd St., Central High School, 3 story, basement, brick, steel. $150,000 or more. Architect not selected.

N. Y., New York—Union Theological Seminary, Bway. and 120th St., soon lets contract 7 story, 100 x 225 ft. dormitory, apartment, Claremont Ave. and 122nd St. $500,000. Allen & Collens, 75 Newbury St., Boston, Mass., archts.

O., Cleveland—John Carroll University, J. J. Bernet, chn., plans by P. L. Small, 1508 Terminal Tower Bldg., group buildings, incl. administration building, 2 dormitories, 2 science buildings, chapel and service building, all brick, steel, concrete, Warrensville Center Rd. $2,500,000.

O., Dayton—Bd. Educ., Ludlow Bldg., plans by Herman & Brown, Reibold Bldg., 3 story, basement, brick, rein.-con., plain found., South Summit St. $350,000.

O., Gambier — Harcourt School, c/o W. G. Mather, 12407 Lake Shore Blvd., Cleveland, sketches by Maier & Walsh, 7016 Euclid Ave., Cleveland, group of 2 story college buildings, incl. administration building, 6 cottages, chapel, service and locker building. $500,000.

O., Kent—Kent State College, 2 story, basement, recitation building, campus. $235,000.

Pa., Ardmore—Bd. Educ. Lower Merion Twp., S. E. Downs, supt., 115 Lenwood St., plans by Savery & Sheetz, St. Girard Bldg., Phila., 2 and 3 story, basement high school, incl. gynasium, swimming pool, Montgomery Ave. Noted Apr. 3.

Pa., Cambridge Springs — Polish National Alliance, S. Kuberski, dean, rebuilding college. $600,000.

Pa., Erie—Bd. Educ., R. S. Scobell, secy., Library Bldg., plans by Myers & Johnson, 821 Commerce Bldg., alterating Technical High School and addition to Old Central High School, 1 story, 20 x 270 ft., brick, steel, 10th and Sassafrass Sts.

Pa., Irwin—Irwin School Bd., C. Drake, pres., rebuilding brick, steel school, recently destroyed by fire. $200,000. Architect not selected.

Pa., Phila.—Bd. Educ. plans by J. T. Catharine, 19th and Ludlow Sts., 3 and 4 story, basement, rein.-con., brick, steel, plain found., 12th and Callowhill Sts. $400,000.

Pa., Pittsburgh—Bd. Educ., Administration Bldg., plans by R. M. Trimble, Commonwealth Annex, Davidson High School, brick, steel, West Liberty St. $600,000.

Pa., Pittsburgh—Sacred Heart Parish, T. F. Coakley, pastor, 6202 Alder St., sketches by C. Strong, Keystone Bldg., brick, stone grade and high school, incl. cafeteria, library, auditorium; Emerson St.

Pa., Sonderton—Bd. Educ., J. N. Zendt, pres., plans by C. M. Talley, 14 West Broad St., 4 story high school. $150,000.

R. I., Central Falls — St. Mathieu's Roman Catholic Church, J. A. Laliberte, pastor, 780 Dexter St., convent, Dexter St. $150,000 or more. Architect not selected.

R. I., Warwick—Town, W. E. Sherman, supt. Schools, Apponaug, Junior High School. $200,000. Architect not selected.

R. I., Woonsocket—See "Churches."

Tenn., Nashville—Marr & Holman, archts., Stahlman Bldg., bids early in February, womans building for Domestic Science and Kindred Arts, also Mechanical and Agricultural Arts units at Agricultural and Industrial State Normal School, for State Bd. Educ. $150,000 each. Noted July 31.

Tex., Galveston—Bd. Educ., c/o J. Neethe, plans by D. N. McKenzie, 2107½ E St., rein.-con., brick school, 35,000 sq.ft. floor space, plain found. $200,000. Noted Nov. 20.

Tex., San Antonio—Bd. Educ., Matagorda and Waters Sts., plans by Phelps & DeWees, Gunter Bldg., (Bd. archts.), and H. P. Smith, National Bank of Commerce Bldg., constructing 3 story, basement, brick, tile, rein.-con. unit, and remodeling present high school into vocational training school, plain found., 500 Main Ave. $150,000.

Wis., Manitowoc—Bd. Educ. plans by Van Ryn & DeGelleke, archts., 114 Wisconsin Ave., Milwaukee, Junior High School, 2 story, basement, 104 x 284 ft., steel, plain found.

Wis., Milwaukee—Bd. School Directors, plans by G. E. Wiley, c/o School Bd.; Solomon Juneau Junior High School, 3 and 4 story, 200 x 225 ft., brick, steel, rein.-con., $850,000, Van Ryn & DeGelleke, 114 Wisconsin Ave., assoc. archts.; 2 story, basement school, North 15th St., $375,000, Eschweiler & Eschweiler, 210 Mason St., assoc. archts. Noted Jan. 8.

Ont., Toronto—Bd. Educ., 155 College St., plans by C. Dyson, 155 College St., 3 story, basement, brick, steel, concrete addition to Humberside Collegiate Institute. $400,000.

Que., Montreal — Roman Catholic School Comn., 113 Ste. Catherine St. W., sketches new school for St. Anns Parish. $300,000.

BIDS ASKED

Calif., Los Angeles—Feb. 11, by Bd. Educ., for University High School Auditorium, 2 story, 98 x 190 ft., Class A rein.-con., for City of Los Angeles School Dist. $175,000.

Calif., San Francisco—L. P. Hobart, archt., Crocker Bldg., taking bids and open same about Feb. 10, brick, steel additions, Golden Gate Park, for California Academy of Science, Golden Gate Park. $250,000.

Conn., Hartford—Feb. 10, by Trinity College, R. B. Ogilby, pres., brick, stone dormitory group. To exceed $200,000. McKim, Meade & White, 101 Park Ave., New York, archts. Noted Nov. 28, 1929.

D. C., Wash.—Feb. 6, by District Comrs., District Bldg., Stewart Junior High School addition. $240,000.

Ill., Chicago — Feb. 10, by Bd. Educ., 188 West Randolph St., school work as follows, Marshall Senior High School, Adams and Kedzie Sts.; Parker Junior High School, 68th and Stewart Sts.; Volto Elementary School, Avers and Argyle Sts.; Holden Elementary addition, 31st and Loomis Sts., incl. concrete excavating, etc., and yard drains (yard improvement); Senn Senior High School addition, marble (old building); lighting fixtures for various schools. P. Gerhardt, 188 West Randolph St., archt.

Ind., Indianapolis—Feb. 10, by School Comrs., A. B. Good, dir., 150 North Meridian St., School 82, 2 story, basement, rein.-con., brick, stone, English and Emerson Aves. $190,000. Noted Jan. 8.

La., Baton Rouge—Louisiana State University, J. M. Smith, pres., and Agricultural & Mechanical College, bids about Feb. 25, 3 story, basement, 280x432 ft. rein.-con., brick, stucco women's dormitory $500,000; 2 story, basement, 130x192 ft., L shaped, rein.-con., brick, stucco students center, $150,000. Wogan & Bernard, Old Reymond Bldg., Boton Rouge, archts. Noted Jan. 1.

Md., Baltimore—Feb. 11, by Bd. Awards, City Hall, 2 story, basement, brick, concrete, hollow tile, steel, Montebello and Gorsuch Aves., for Mayor and City Council, W. H. Emory, Jr., Baltimore Trust Bldg., archt. H. Massart, 328 North Charles St., engr.

Mass., South Hadley — Feb. 10, by Mt. Holyoke College, M. E. Wooley, pres., 3 story, basement, brick, stone physical laboratory. $200,000. Putnam & Cox, 114 State St., Boston, archts. Noted Jan. 1.

N. J., Bloomfield—Bd. Educ., City Hall, bids about Apr. 1, general contract 2 story, basement, brick, steel, plain found., Watchung and Broughton Aves. $350,000. Bartlett & Marsh, Lefcourt Bldg., Newark, archts. Noted Jan. 29.

N. J., New Lisbon—Feb. 18, by Dpt. Institutions & Agencies, State Office Bldg., Trenton, school and superintendent's cottage, at State Colony for Feeble Minded Males. $150,000. C. N. Leathem, State Office Bldg., Trenton, engr.

N. J., Trenton—State Bd. Educ., State House Annex, bids about Feb. 15, 2 story, basement, brick, steel, rein.-con. teachers college addition, Lake Blvd. $375,000. Guilbert & Betelle, 20 Branford Pl., Newark, archts. Noted Dec. 11.

N. Y., Brooklyn—Feb. 10, by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., general contract P. S. 101, addition, Benson Ave., from 24th Ave. and Bay 35th St., for Bd. Educ., 500 Park Ave., New York. Noted Jan. 6.

N. Y., New York—Feb. 10, by W. C. Martin, archt. and supt. School buildings, Flatbush Ave. extension and Concord St., Brooklyn, general contract P. S. 106, St. Raymond Ave. from Odell St. to Olmstead Ave., for Bd. Educ., 500 Park Ave. Noted Jan. 8.

N. Y., Rochester — Colgate Divinity School, taking bids general contract college divinity school. $1,000,000. James Rogers Gamble, 154 East 46th St., New York, archt. Noted Jan. 22.

Pa., Berwyn—Feb. 17, by Bd. Educ., Easttown Twp., c/o W. E. Goff, 2 story, basement, 37 x 93—100 x 65—37 x 93 ft., steel, brick, plain found. Davis & Dunlap, 1805 Walnut St., Phila., archts.

Pa., Brentwood—Feb. 24, by Bd. C. H. Bracken, secy., 3108 Brownsville Rd., High School, brick, steel, limestone, Brownsville and Point View Rds., $250,000. E. B. Lee & H. W. Viehman, Chamber of Commerce Bldg., Pittsburgh, archts.

Que., St. Hyacinthe—Technical School Comn., City Hall, bids on Feb. 15, 3 story, basement, 80x150 ft., and 40x80 ft., brick, rein.-con. technical school, spread footing found., Laframboise St. $175,000. G. R. Richer, Bank of Commerce Bldg., archt. City will probably let subcontracts and supervise all work.

CONTRACTS AWARDED

Calif., Santa Barbara—Santa Barbara School Dist., general contract McKinley High School, 2 story, basement, rein.-con., incl. administration, gymnasium, shop, to Minton Co., Mountain View, $134,415. Noted Jan. 1.

Del., Wilmington—Mary and William School, Delaware School Foundation, Du Pont Bldg., general contract 2 story, basement, 145x285 ft., brick, steel, plain found., to Wm. M. Francis Co., Du Pont Bldg., $338,900; plumbing and heating, to W. D. Shellady & Co., 1015 Lancaster Ave., $81,400. Noted Dec. 25.

Ind., Bloomington—Bd. Trustees Indiana University, J. W. Craven, secy., general contract Indiana Union Building for Men, 4 story, basement, 100x340 ft., rein.-con., limestone, to E. A. Carson, 1201 East 30th St., Indianapolis, $531,345. Noted Jan. 8.

Md., Baltimore—Bd. Awards, 3 story, 83 x 83 ft., brick, hollow tile, granite addition to School 122, incl. classroom, gymnasium wing, Preston St. and Druid Hill Ave. to T. Mullan Contg. Co., 3945 Greenmount Ave., $127,526. Noted Jan. 15.

Mich., Detroit—Bd. Educ., 1354 Broadway Ave., 2 story, basement, brick, rein.-con., steel high school, plain found., to Chissus Bros., 607 Donovan Bldg. Est. $366,000. Noted Jan. 8.

N. J., Irvington (br. Newark)—Bd. Educ., 1253 Clinton Ave., general contract Junior High School, 3 story, basement, brick, steel, to L. Deutsch Inc., 879 Bergen St., Newark, $258,000; plumbing, to A. R. Gasewind Co., 1060 Broad St., Newark, $18,500; heating, to J. H. Nelles Co., 835 Springfield Ave., $34,790; electrical work, to Broad Electric Co., 317 West Market St., Newark, $21,785. Grand total $333,075.

N. J., Plainfield—J. S. Pigott, archt., 42 Walnut St., Newark, general contract 2 story, basement, brick, steel, plain found., to M. D. O'Keeffe, 685 West 4th St. Est. $300,000. Noted Jan. 15.

N. J., Roselle Park — Bd. Educ., Robert Gordon School, general contract high school, to Walter Kidde Constr. Co., 140 Cedar St., New York, $245,000; plumbing, to G. H. Van Varick, 28 Hillman St., Clifton, $13,400; heating and ventilating, to F. P. Farrell, 269 Camden St., Newark, $45,922; electrical work, to A. N. Meister, 401 South 15th St., Newark, $20,848. Grand total $325,170. Noted Jan. 1.

N. Y., New York — Bd. Educ., 500 Park Ave., general contract Bronx Continuation School, to Royal Rice Co., Inc., 139 East 57th St., $606,500. Noted Dec. 4.

N. Y., Woodhaven — Bd. Educ., 500 Park Ave., New York, general contract P. S. 63, to M. D. Lundin Co., Inc., 103 East 125th St., New York, $99,400. Noted Dec. 18.

O., Toledo—Bd. Educ., M. T. Forster, clk., Feilbach School, 2 story, brick, steel, concrete, to Kopitke Constr. Co., 323 Wabash Ave., Cleveland. Est. $250,000. Noted Dec. 11.

Pa., Apollo—Bd. Educ., J. C. Hunter, pres., general contract, 2 story, basement, 124x163 ft., brick, hollow tile, limestone high school, to Fairchance Lumber Co., Fairchance, $111,980. Noted Jan. 29.

R. I., Central Falls—St. Mathieu's Roman Catholic Parish, J. A. Laliberte, pastor, Fenner St., Providence, altering and constructing 2 story, basement, brick, stone, steel school addition, plain found., day labor. $150,000. W. T. Containi, 285 Main St., Woonsocket, archt. Noted Jan. 8.

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STORES

PROPOSED WORK

Calif., Oakland—J. Breuner Co., Clay St., plans by A. F. Roller, 1st Natl. Bank Bldg., San Francisco, 8 story, basement, 100x208 ft., Class A furniture store, 21st St. and Bway. $1,000,000. H. J. Brunnier, Sharon Bldg., San Francisco, engr.

Conn., Waterbury—Grieve Bisset & Holland, Inc., 21 North Main St., sketches by W. E. Hunt, 182 Church St., Torrington, altering Odd Fellows building into store and constructing 2 story, basement, 80 x 90 ft., brick, steel addition, North Main and Phoenix Sts. $150,000.

Me., Bridgeton—W. Davis, Bridgeton, rebuilding 1 and 2 story, store, office and theater building, Main St. $150,000. Architect not selected.

Mass., Boston—Heirs of J. Bennett, c/o G. F. Wentworth, 11 Pemberton Sq., 6 story, basement, brick, steel store, light manufacturing and loft building, 11 Columbia St. To exceed $150,000. Private plans.

N. J., Lyndhurst (br. Rutherford)—Owner, c/o P. J. Jossier, archt., 240 Broad Ave., 2 story, basement, 90x100 ft., brick, steel, store and apartments. $150,000. Project abandoned. Noted Jan. 8.

N. J., East Orange—R. H. Muir, 546 Main St., 4 story, basement, 100x110 ft., brick, steel department store, Main and Prospect Sts. $150,000. Project in abeyance. Starret & Van Vleck, 393 7th Ave., New York, archts. Noted Nov. 6.

N. J., Newark—Kresge Department Store, A. Schendel, genl. mgr., 715 Broad St., sketches altering department store, 715 Broad St. $350,000. Escalators.

N. J., Newark—Owner, c/o E. A. McMurray, archt., 339 Millburn Ave., Milburn, 2 story, basement, brick, steel store, apartment, 18th and Melrose Aves. $150,000. Project in abeyance. Noted Jan. 22.

N. J., Palisades Park—Owner, c/o P. J. Jossier, archt., 240 Broad Ave., sketches 2 story, basement, brick, steel store, apartment, Broad Ave. $150,000.

O., Cleveland—May Co., N. L. Danby, vice pres., Euclid Ave., soon lets contract 2 story, 200 x 400 ft., steel, concrete, terra cotta top addition to department store, Euclid Ave. $500,000. Graham, Anderson, Probst & White, 80 East Jackson Blvd., Chicago, Ill., archts. Noted Jan. 1.

BIDS ASKED

Calif., Los Angeles—F. and W. Grand-Silver Stores, Inc., 337 Bway. and 902 Bway., New York, taking bids 6 story, basement, 59x158 ft., rein.-con., brick, terra cotta, steel, 537-41 South Bway. $250,000. Walker & Eisen, Western Pacific Bldg., Archts. Noted Dec. 25.

CONTRACTS AWARDED

Mass., Boston—Owner, c/o Richmond Bros. Co., lessee, 1600 East 55th St., Cleveland, O., 8 story, basement, 30,000 sq.ft. floor space, brick, stone, steel store and sales building, plain found., to D'Amore Constr. Co., 89 State St. Est. $150,000. Noted Jan. 29.

THEATRES

PROPOSED WORK

Calif., Inglewood—United Artists Theatres of California, Inc., 931 South Bway., Los Angeles, plans by Walker & Eisen, Western Pacific Bldg., Los Angeles, 1 story concrete theatre, $150,000.

Ia., Sioux City—A Sanford, Frances Bldg., bids in late spring general contract theater addition, 6th and Pierce Sts. $300,000. Rapp & Rapp, 190 North State St., Chicago, Ill., archts.

Mass., Boston — Terminal Theatre Co., N. Thompson, 312 Congress St., sketches by Hendrick & Haywood, 192 Boylston St., theatre, South Station Wing, corner Dor Ave. and Summer St. To exceed $150,000.

Mass., Salem—Salem Realty Co., J. A. Deery, Salem Trust Co., 71 Washington St., theatre, 200 Essex St. $150,000 or more. Architect to be announced later.

N. J., Paterson—F. R. B. Realty Co., c/o A. Collier & Son, Inc., 126 Market St., will not build 10 story, basement, brick, steel, rein.-con. theatre, office, 207-11 Market St. $500,000. Project abandoned. Noted May 2, 1929.

N. Y., Baldwin—Baldwin Theatre will not build theatre, $150,000. Tillion & Tillion, 415 Lexington Ave., New York, archts. Project abandoned. Noted May 1.

N. C., Charlottesville — Paramount Publix Theatres, Paramount Bldg., New York, plans by Rapp & Rapp, Paramount Bldg., New York, theatre. $350,000.

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Pa., Coatesville—United Chain Theatres, Inc., c/o L. Berman, Tower Bldg., Philadelphia, plans by Hodgens & Hill, 130 South 15th St., Phila., 4 story, basement, 165x269 ft., incl. stores, apartments, 145-53 Main St.

Pa., Wilkes-Barre — Warner Bros. Pictures, Inc., 321 West 44th St., New York, received no bids Jan. 15, theatre. Project postponed until spring or later. John Eberson, 370 Lexington Ave., New York, archt. Noted Jan. 15.

R. I., Pawtucket—H. A. Warburton, 625 East Ave., sketches by J. F. O'Malley, 84 Broad St., theatre, hotel, Dexter and Bayley Sts. To exceed $150,000.

BIDS RECEIVED

Calif., Alameda—Miller & Pflueger, archts., 580 Market St., San Francisco, taking bids 126 x 210 ft., Class A steel, rein.-con. theatre, 2,200 seating capacity, North Central Ave. and Park St., for Alameda Amusement Co., c/o architects. $350,000. Noted Oct. 9.

CONTRACTS AWARDED

Mass., Brookline—D. B. Church, 1650 Beacon St., 1 and 2 story, basement, brick, steel theatre, store, office, 280-290 Harvard St., to F. J. Van Etten Co., 250 Stuart St., Boston. $150,000 or more. Warner Bros. Pictures, Inc., lessee.

N. J., Hackensack—T. W. Lamb, archt., 644 8th Ave., New York, general contract 1 and 2 story, 125 x 200 ft., brick, steel theatre, to J. McWilliams Co., Inc., 11 East 44th St., New York, for William Fox, 850 10th Ave., New York. Est. $500,000. Noted Jan. 8.

N. Y., New York — Corporation, c/o H. Diamond, 123 William St., theatre, store, office, to St. Cloud Constr. Co., c/o owner. Est. $200,000. Contractor taking bids on separate contracts. Noted Dec. 25.

O., Mansfield — Bd. Memorial Trustees, C. Willett, secy., King Bldg., remodeling theatre, 1,500 seating capacity, to Hossler Bros., Tiffin. Est. $200,000. Noted Dec. 11.

UNCLASSIFIED

PROPOSED WORK

Ariz., Tucson—ART INSTITUTE—Tucson Institute of Art, L. Urgelles, dir., sketches, 2 story art institute. $250,000.

Ark., Texarkana—BROADCASTING STATION—Chamber of Commerce field application with Federal Radio Comn., to construct new 100-watt power radio broadcasting station. R. Maxwell, assistant mgr.

Calif., Grass Valley — ORPHANAGE — St. Patricks Orphanage sketches fireproof orphanage, incl. dormitory, assembly hall, kitchen building, with dining rooms, laundry. $225,000.

Calif., Los Angeles—MARKET—A. F. Norton, 111 South Manhattan Pl., plans by R. Falkenrath, Chamber of Commerce Bldg., 1 story, mezzanine floor, 140x150 ft., brick, steel, Romaine and Weston Aves. $150,000.

Calif., Los Angeles—MISSION—United Rescue Mission, 226 South Main St., sketches 4 story, basement, rein.-con. society building, incl. auditorium, dormitory, dining room, kitchens, Main St. near 2nd St. $175,000. Architect not selected.

Calif., Sacramento—FAIR BUILDINGS—State of California plans by B. G. McDougall, state archt., Public Works Bldg., poultry building $75,000, and live stock building. $125,000, both 1 story brick. State Fair Grounds.

Calif., Sacramento—ORPHANAGE—Catholic Diocese plans by H. J. Devine, California Life Insurance Bldg., orphanage, near here. $200,000.

Mass., Boston—RAPID TRANSIT STATION—Commonwealth of Massachusetts, Dept. P. Utilities, rapid transit station for Cambridge Subway, Charles and Cambridge Sts. $375,000. E. Springer, 1 Beacon St., engr. Transit Dpt.

Mass., Lynn—EXCHANGE — New England Telephone & Telegraph Co., 50 Oliver St., Boston, soon takes bids 3 story, basement, 16,000 sq.ft. floor space, brick, stone, steel, concrete found., City Hall Sq., Essex and Washington Sts. To exceed $150,000. Densmore, LeClear & Robbins, Park Sq. Bldg., archts.

Mass., Foxboro—HOME—Doolittle Home, C. Conklin, pres., Broadway, Taunton, plans by Hutchins & French, 11 Beacon St., Boston, and soon takes bids altering and constructing 3 story, basement, brick, steel addition to home for aged, plain found. $150,000. Noted Aug. 28.

Mass., North Easton—LIBRARY—Owner, c/o Coolidge, Shepley, Bulfinch & Abbott, archts., Ames Bldg., Boston, sketches altering and constructing Ames Memorial Library addition. $150,000 or more.

Mich., Detroit—EXCHANGE—Michigan Bell Telephone Co., 1365 Cass Ave., plans by Smith, Hinchman & Grylls, 800 Marquette Bldg., 4 story, basement, brick, steel, rein.-con., exchange, office, plain found., Grand River and Greenfield Aves. $250,000.

N. H., Manchester—PUBLISHING—Union Leader Publishing Co., 48 Hanover St., and Lockwood Greene Engrs., Inc., engr., 24 Federal St., Boston, Mass., soon let contract 3 story, basement, 100 x 100 ft., brick, stone, concrete, plain found., to exceed $150,000; heating and electrical work to exceed $25,000.

N. J., Hackensack—EXCHANGE—New Jersey Bell Telephone Co., 540 Broad St., Newark, brick, steel, State St. $150,000. **Maturity probably soon.**

N. J., Lakewood — MOTION PICTURE STUDIO, etc.—Lakewood Studios Co., G. H. Glass, pres., c/o D. J. Scrocco, archt., 60 Park Pl., Newark, 2 story, basement, 10 story tower, 200 x 800 ft., brick, steel motion picture and radio broadcasting studio, plain found., Pine Forest Manor. $500,000. Project in abeyance. Noted Jan. 8.

N. J., Newark—HOME—Daughters of Israel Hebrew Orphans Sheltering Institution, 12 Homestead St., revised sketches by L. Kasoff, 164 Market St., 3 story, basement, brick, steel orphanage, 12 Homestead Park. $150,000. Noted Mar. 6.

N. J., Newark—MARKET—Steuben Holding Corp., 60 Park Pl., revised sketches by F. H. Koenigsberger, 48 Walnut St., 2 story, basement, brick, steel, Washington and Linden Sts. $200,000. Noted Jan. 5.

N. J., Newark — MAUSOLEUM — Roman Catholic Diocese of Newark, J. A. Duffy, vicar general, Chancery Office, will not build mausoleum, $1,000,000. Project abandoned. Noted Aug. 8.

N. J., Penns Grove—EXCHANGE—New Jersey Telephone Co., 540 Broad St., Elizabeth, plans by H. B. Brady, Inc., 333 North Broad St., Elizabeth, 2 story, basement, brick, steel, plain found. $150,000.

N. J., Spring Lake—EXCHANGE—New Jersey Bell Telephone Co., A. C. Havens, mgr., 540 Broad St., Newark, brick, Morris and 3rd Aves. $150,000. **Maturity probably in 1932.** Noted Aug. 14.

N. J., Trenton—PASSENGER STATION—Pennsylvania R.R. Co., T. J. Skillman, ch. engr., Broad St., Phila., Pa., bids in May, general contract 2 story, basement, brick, steel railroad station, $150,000. E. A. Dennison, 40 East 49th St., New York, archt. Noted Dec. 4.

R. I., Providence—SOCIETY—Rhode Island Historical Society, A. P. Munroe, pres., Waterman St., sketches by Jackson, Robertson & Adams, Turks Head Bldg., altering and constructing addition. $150,000 or more.

Wis., Milwaukee — RESTAURANT, etc. — Owner, c/o B. Schnyder, engr., 2021 South 25th St., 4 story, 80 x 150 ft., brick, steel, restaurant, roof garden, ballroom.

BIDS ASKED

Conn., New Britain — HOME — Feb. 25 (selected list of bidders), by Jerome Home for Aged, C. N. Stanley, pres., 2 and 3 story, brick, steel addition, Corbin and Black Rock Aves. $150,000 or more. W. F. Brooks, 48 High St., archt.

Mo., St. Louis—EXCHANGE—Southwestern Bell Telephone Co., 11th and Pine Sts., bids about Apr. 1, Forest Delmar Exchange, 2 story, basement, 100 x 130 ft., rein.-con., brick, Delmar and Clarendon Aves. I. R. Timlin, 1916 Telephone Bldg., archt. W. O. Pennell, c/o owner, ch. engr. Noted Jan. 15.

Md., Baltimore—AUDITORIUM—Feb. 16, by B. Evander, archt., 20 East Lexington St., 1 story, mezzanine, balcony, brick, cut stone, hollow tile, 1207-15 North Charles St., for Tall Cedar Building Corp., c/o architects. $150,000.

N. J., Newark—MERCANTILE—Feb. 14, by R. B. Flatt, archt., 600 Bloomfield Ave., Bloomfield, general contract 1 story, brick, steel, rein.-con., 171 Thomas St., for Gude & Cole, Inc., 74 Clinton St. $150,000.

CONTRACTS AWARDED

Calif., Oakland—ORGANIZATION—Salvation Army, 13th and Grove Sts., 6 story, Class C, brick, concrete, 15th and Grove Sts., to Jacobs & Pattiani, 337-17th St., $240,900.

Md., Baltimore—FRUIT EXCHANGE—Pennsylvania R.R. Co., Broad St. Sta., Phila., Pa., T. J. Skillman, ch. engr., 1 and 2 story, 72x660 ft., brick, steel, hollow tile fruit exchange, to M. A. Long Co., 10 West Chase St., $650,000. Reported incorrectly bids Feb. 21 in Jan. 22 issue.

N. J., Peapack—EXCHANGE—New Jersey Bell Telephone Co., 540 Broad St., Elizabeth, general contract altering and constructing 2 story, basement, brick, steel addition, plain found., to J. Bodine Co., Gladstone, $150,000. Noted Jan. 15.

N. Y., New York — DORMITORY, etc. — L'Englise St. Jean Baptiste, 184 East 76th St., general contract brothers home, apartments, to P. J. Brennan, 624 Madison Ave. Est. $160,000. Noted Nov. 27.

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